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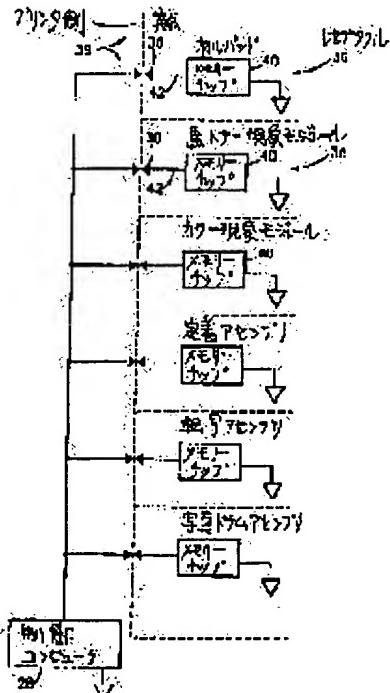
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## (54) EXCHANGEABLE PART HAVING INTEGRATED MEMORY FOR WORKING CONDITION DATA OR THE LIKE

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide exchangeable parts and consumption parts having an integrated memory capable of being memorized and altered in both the working condition data and correction data.

SOLUTION: These parts are such that an access and alteration can be done relative to data parameters for controlling the working condition of exchangeable parts and consumption parts memorized in a memory 40. By the use of a serial access memory, an input and output operation become possible on one electric wire and, in this way, by altering no physical interface between the exchangeable parts and consumption parts and the connector, a memory can directly be replaced instead of a fuse provided at present.



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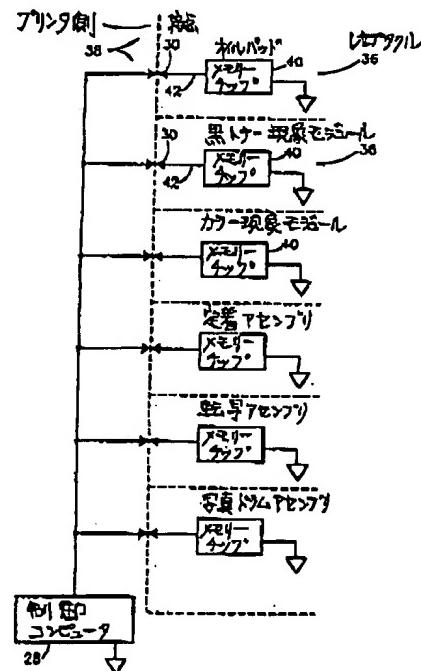
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(54)【発明の名称】 使用状態データ等用の一体化メモリを有する交換可能な部品

(57)【要約】 (修正有)

【課題】 使用状態データと校正データの両方の記憶および変更が可能な一体化メモリを有する交換可能部品/消耗部品の提供。

【解決手段】 メモリ40に記憶された交換可能部品/消耗部品の使用状態、校正および装置の動作を制御するためのバラメータを表わすデータに対するアクセスおよび変更が可能である。またシリアルアクセスマモリの使用によって1本の電線上での入出力が可能となり、これによって交換可能部品/消耗部品-コネクタとの間の物理的インターフェースに変更を加えることなく、現在設けられているヒューズの代わりにメモリの直接的置換が可能である。



## 【特許請求の範囲】

【請求項1】交換可能なインクカートリッジであって、インクジェットプリンタを制御するプロセッサ手段を含むインクジェットプリンタのインクジェットプリントヘッド用の交換可能なインクカートリッジであり、前記インクジェットプリンタは前記インクカートリッジを受けるレセプタクルを含み、前記レセプタクルは前記プロセッサ手段に結合された第1のコネクタ手段を含み、前記インクカートリッジは以下(a)ないし(d)を含むことを特徴とする。

- (a) インクを保持するインク溜め。
- (b) 前記インクカートリッジが前記レセプタクルに押入されると前記第1のコネクタ手段と係合する第2のコネクタ手段。
- (c) 前記インクカートリッジが前記レセプタクルに押入されると前記インク溜めを前記インクジェットプリントヘッドに接続する液通手段。
- (d) 前記第2のコネクタ手段に接続され、1本のデータ出入力線のみを有し、これによって前記プロセッサ手段にとってアクセス可能となるシリアルアクセスメモリであって、少なくとも前記インク溜め内のインクの使用状態を示すデータを記憶するシリアルアクセスメモリを含む。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は交換可能な消耗部品および補給部品を用いる装置に関し、より詳細には使用状態データ、校正データおよび他のデータを記憶するための一体化メモリを有する消耗部品および補給部品に関する。

## 【0002】

【従来の技術】最近の複写機、プリンタ、プロッタその他はほとんどすべて高品質な文書の作成を行なうために内部構成要素用の入力校正データを必要とする制御マイクロプロセッサを有する。かかる装置のほとんどはユーザーが消耗品の交換を行なうように構成されるが、使用状態データおよび校正データの入力を交換を実行するユーザー（あるいはサービスマン）が行なわなければならない。校正データの入力に誤りがあると、装置の性能が大きく低下したり動作不能になる可能性がある。

【0003】消耗部品の使用状態の判定については、従来技術は一般にユーザーに交換の必要な時期を知らせるための単純な記録入力程度に限られていた。たとえば、複写機は出力ページ数の表示およびドラム（あるいは有機感光ウェブ）の回転数の内部記録を維持してプロセッサがサービスあるいは交換の必要な時期を信号で知らせることを可能にしていることが多い。

【0004】現在多くの電子写真式のプリンタおよび複写機に交換可能な現像モジュールが用いられている。各現像モジュールはトナーとトナーキャリヤ、さらにトナ

ーとキャリヤの混合物をドラム（あるいはウェブ）面に送るための機構を有する。レーザー露光システムのための適正な制御信号レベルを得るために、制御マイクロプロセッサは適当な混合物を得られるようトナーとキャリヤの比率を調整する。トナー対キャリア比の制御方法としては、トナー-キャリヤ比によってその周波数が変化する発振回路を設ける方法がある。新しい現像モジュールの取付時に、制御プロセッサは何分もかけてこの発振回路からトナー-キャリヤ比を判定できるだけの十分なデータを蓄積してレーザー露光システム内に適正な信号レベルを設定しうるようにする。現像モジュールが装置から取り出されたり、他の装置に移されたりすると、この校正手順全体を繰り返し実行しなければならない。

【0005】上述したように、プリンタや複写機は従来出力ページ数をカウントしていたが、かかる単純なページカウント値には媒体タイプの違いによって生じる消耗度の違いは反映されない。たとえば、（その一方あるいは両方が加熱される一対のプラテンローラを含む）定着アセンブリには標準的な媒体タイプで約80,000ページの印刷を行なうと表面破壊現象が生じる。媒体タイプの相違によって定着アセンブリの消耗にはばらつきが生じ、単純なページカウント値にはかかるばらつきは反映されない。

【0006】カラープリンタに用いられる定着アセンブリには彩度を上げ、印刷後の媒体に光沢を与えるためのシリコーンオイルが用いられる。塗布されるオイルの量は媒体タイプによって変えなければならない。定着アセンブリが媒体タイプを知り、塗布すべきオイルの量を判定しうるようにするための制御システムが設けられる。プロセッサはオイルの累積使用量を記録するが、定着アセンブリが取り外されるとオイル使用状態に関する記憶データが失われると、定着アセンブリを再び使用するさいにはこの使用状態を再構築する方法がない。

【0007】同様に、電子写真式ドラムは所定の電荷密度を示す感光層を有する。かかる電荷密度のデータはレーザー露光システムの電力制御ループの制御パラメータとして用いられる。従来、かかる電荷密度データはオペレータによって入力されていた。しかし、サービス時に見られるようにドラムがプリンタ間で移動されると、かかるデータはドラムとともに移すことはできず、入力し直さなければならない。

【0008】インクジェットプリンタには一体化されたインク入れを有する使い捨てのプリントヘッドが用いられる。本願と同一譲受人に譲渡されたArthurその他の米国特許5,049,898号に開示する使い捨て印刷アセンブリにおいては、一体化メモリ要素にそのアセンブリの特徴を記述するデータが記憶される。Arthurその他は、プリントヘッド中のインクの色、その量、およびプリントヘッド本体上のインクジェットオリフィス板の位置を指定するメモリを有するインクジェットプリントヘッドアセ

ンプリを提供した。かかるデータはプリントヘッドからプリンタ内の読み出し/書き込み要素によって読み出され、必要に応じて使用あるいは表示される。

【0009】インクジェットプリンタには、プリントヘッドを高い信頼性で動作させ、また高品質の印刷ジョブの継続的生成を可能にするための（インストールされたプリンタドライバからの）多数のパラメータが用いられる。周知のように、サーマルインクジェットプリントヘッドにおいては、通電されることによって1つあるいはそれ以上のインク滴を射出するインクジェットオリフィスのそれぞれに加熱抵抗器が用いられる。所望のインク滴の量を得るために加熱抵抗器に印加される電流量はいくつかの要因の組み合わせによって決まり、またこれはあるアルゴリズムの計算結果である。インク滴の量は検出温度、インクの特性を反映する定数、インクオリフィスの構造その他によって決まる。かかるパラメータは毎回投入時にプリンタドライバからインクジェットプリンタに供給される。

【0010】メーカーがかかるパラメータに修正が必要であると判断する場合、メーカーはプリンタドライバの更新版を発行し、これを過去の購入者と新規購入者のいずれにも供給するように処置しなければならない。さらに、プリントヘッドの設計を製造中に変更する場合、かかる変更にはパラメータの変更を必要とすることが多い。この場合にも新しいプリンタドライバが必要になる。

#### 【0011】

【発明が解決しようとする課題】プリンタや複写機用の消耗交換部品の多くはそれに一体化され、その交換部品が新品であるか使用済みのものであるかを示すヒューズを有する。交換部品の挿入時に、制御マイクロプロセッサがそのヒューズがとんでいないと判定すると、機械はその交換部品を新品であると判定し、その部品の使用可能期間を示すカウント値をゼロにする。交換部品についてさらに入力データが必要である場合、マイクロプロセッサは制御パネル上でユーザーにかかるデータが必要であることを表示するか、あるいは（現像モジュールにおけるトナー対キャリア比の場合のように）交換部品センサーから自動的にそのデータを収集する。その後、ヒューズがとばされる。

【0012】電子写真式プリンタ用のかかる従来技術による回路を図1に示す。この回路では複数の消費部品のそれぞれがインターフェース10でプリンタにプラグ接続されている。このプラグ接続される消費品にはオイルパッドモジュール12、黒（K）トナー現像モジュール14、カラー現像モジュール16、定着アセンブリ18、転写アセンブリ20、写真ドラムアセンブリ22等がある。当業者には、上述の消費部品の他にもプリンタにプラグ接続可能な消耗部品があることは理解されよう。各消耗部品は制御コンピュータ28による校正動作が完了するとヒューズ

溶断回路モジュール26によって溶断されるヒューズ24を有する。ヒューズ24は交換部品のそれぞれの構造に組み込まれ、1本の電線を介してプリンタ内のコネクタにインターフェースされた多接点コネクタの接点30に接続される。交換部品内のアース接続32によってヒューズ24を通過する回路が完成する。

【0013】本発明の目的は使用状態データと校正データの両方の記憶および変更が可能な一体化メモリを有する交換可能部品/消耗部品を提供することである。

【0014】本発明の他の目的はその部品とそれを取り付ける装置との間の既存の物理的インターフェースに対する変更を必要としないメモリモジュールを有する交換可能部品/消耗部品を提供することである。

#### 【0015】

【課題を解決するための手段】インクジェット印刷/複写装置は印刷/複写動作に用いられる交換インクカートリッジを収容するようになっている。かかる装置はその装置の動作を制御するプロセッサに結合された第1のコネクタを有するレセプタクルを有する。カートリッジは第2のコネクタを有し、このコネクタは、第1のコネクタおよびこの第2のコネクタに接続されたメモリに係合する。このメモリからのデータ転送およびこのメモリへのデータ転送の両方が可能であり、これによってメモリに記憶された、カートリッジの使用状態、校正および装置の動作を制御するためのパラメータを表わすデータに対するアクセスおよび変更が可能である。カートリッジ上のシリアルアクセスメモリの使用によって1本の電線上での入出力が可能であるが、これによって、カートリッジとカートリッジの装置への係合を可能にするカートリッジコネクタとの間の物理的インターフェースに変更を加えることなく、現在設けられているヒューズの代わりにメモリの直接的置換が可能である。

#### 【0016】

【発明の実施例】以下に、本発明を電子写真式プリンタおよびインクジェットプリンタを参照して説明するが、本発明は交換可能部品/消耗部品を有する任意のコンピュータ制御された装置に適用可能である。

【0017】本発明は交換可能な部品に内蔵される半導体メモリモジュールへの使用状態データおよび校正データの記憶を可能にするものである。したがって、交換可能部品が第1の装置から第2の装置に移される場合、第2の装置においてこの部品のオンボードメモリに記憶されたデータにしたがってその制御パラメータの調整が可能である。これは、装置制御信号を生成するために交換可能部品からのデータを他のデータと相關させなければならない場合に特に重要である。たとえば、プリンタ内で検出される湿度データは感光体の感度データと組み合わせると、レーザーの露光設定に直接的に影響を与える。誤った感光体感度データが用いられると、プリンタの性能に悪影響が出る。

【0018】最近では、単線入出力シリアルメモリが市販されるようになってきている。かかる種類のメモリとしてはDallas Semi-Conductors IncのDS1992-DS1995 Touch Memoryシリーズがある。これらのメモリはそれぞれ1Kから16Kバイトの記憶容量を有する不揮発性ランダムアクセスメモリとして構成される。DS1992の場合、内部の128バイトの不揮発性RAMが各32バイトの4つの記憶領域および32バイトのスクラッチパッドとして構成される。この単線メモリからのデータの入出力は、読み出し/書き込み動作の始まりを表わすさまざまな長さのパルスを用いるプロトコルによって行なわれる。これらのパルスの後にビット単位の転送が行なわれ、この転送においては1と0は異なるパルス長で表わされる。本発明にはこれ以外のシリアル入出力メモリを用いることもできる。

【0019】【電子写真式プリンタ】図2に示すように、それぞれの交換可能部品/消耗部品はプリンタ38内のレセプタクル36(簡単に示す)に係合する。図1に示すヒューズはそれぞれメモリチップ40に置き換えられており、このメモリチップは電線42を介して既存のコネクタ30に接続され、交換可能部品に関する使用状態データと校正データの両方を記憶することができる。図3には、プリンタ内での交換可能部品50とコネクタ52とのインターフェースをさらに詳細に示す。交換可能部品50は単線メモリチップ40と電子部品モジュール56とが取り付けられたインターフェースボード54によって相互接続された複数のセンサーA-Nを有する。(ボード54上の相互接続の大部分は図面を簡略化するために図示されていない)センサーA-Nは電子部品モジュール56に信号を供給し、このモジュールはコネクタ52および接続されたさまざまの制御線および検出線にインターフェース機能を与える。単線メモリチップ40からの線42は接点30を介してメモリ線58に接続され、メモリ線58は制御コンピュータ28に接続され、これによってメモリチップ40に対する読み出し動作と書き込み動作の両方が可能になっている。

【0020】制御コンピュータ28が特定の交換可能部品を同定することを可能にするには、交換可能部品部品のタイプごとにシリアルナンバーの各ブロックをあらかじめ割り当てておくことが望ましい。制御コンピュータ28には、特定の交換可能部品に取り付けたメモリチップ40に記憶されたシリアルナンバーを読み出すだけでその特定の交換可能部品の同定を可能とする適当なデータがあらかじめロードされる。

【0021】プリンタの動作時には、制御コンピュータ28は定期的に起動され、センサーA-Nからの出力を記録させてこの検出データを用いてシステムの調整を行ないうるようにする。このとき、複数のメモリチップからのデータは従来に比べより正確な調整を行ないうるように相関づける。たとえば、上述したように、定着アセンブリは供給される媒体シートのタイプに応じて媒体シート

トに塗布されるシリコーンオイルの量を決めていた。従来のシステムでは、シリコーンオイルの塗布速度を変更するために光センサーを用いて媒体シートの反射率を検出していった。シリコーンオイルはスポンジ状の媒体に染み込ませてあるため、選択されたタイプの媒体シート上でシリコーンオイルの塗布量を大きくするためには定着アセンブリのローラの速度が落とされる。現在のところ、オーバーヘッドプロジェクタ用の透明紙に対して定着を行なう場合、EPプリンタではローラ速度を約50%低下させる。このように速度を落とすことによって、シリコーンオイルの塗布量はおよそ2倍になる。本発明を用いることによって、またメモリチップ40に記憶されたデータから得られるシリコーンオイルの過去の使用状態についての詳細な知識に基づいて、定着ローラの温度を上げることによって、ローラの速度を落とすことなくシリコーンオイルの放出速度を上げて所望の彩度を得ることができる。したがって、過去のシリコーンオイルの使用歴を正確に知ることによって、定着ローラの温度を制御コンピュータ28によって変更して、定着システムをシリコーンオイルが高温で塗布される状態で全速で動作させることができることが可能になる。

【0022】同様にして、現像モジュールのバラメータに応じてより正確な制御を可能にするデータをメモリチップ40に記憶することができる。現在のところ、カラー現像モジュールについて制御コンピュータ28の記憶する情報はセンサーのオフセット値、ページカウント値、および湿度値に限られている。センサーのオフセット値はトナー-キャリヤ比の制御に用いられる。ページカウント値もまたトナー対キャリア比を変更して現像器の機械的アセンブリの経時変化およびキャリヤ自体の経時変化を補償するのに用いられる。キャリヤはトナーの搬送に用いられる磁性材料でありトナー粒子上での適切な静電荷の発生を助ける。

【0023】メモリチップ40は好適には画像の生成に影響を与える現像モジュールバラメータに関する追加のデータを記憶する。かかるデータには、現像器の磁石の強度、現像器のスリーブと感光ドラムの絶対距離、現像器の表面の粗さ、磁石の絶対角度等がある。上述したバラメータはそれが現像の質に直接的に影響し、制御コンピュータ28は上述の記憶されるバラメータを判定することによってその変動をより精密に補償することができる。同様に、ドラムに付随するメモリチップ40はそのドラムの光電感度(すなわち、充放電特性)を記録する。制御コンピュータ28はトナー-キャリヤ比、レーザー出力、および現像モジュールとドラム感光体の双方のバイアス設定を調整することによってこのバラメータの変動を補償する。

【0024】さらに、トナーとともに用いられるキャリヤ粒子はこのキャリヤがトナーに電荷を供給する能力を示す電荷質量比を有する。かかる電荷質量比は製造後に

記録され、電荷質量比が低ければこれはトナーに対する制御が弱く、トナーがドラムにより付着しやすいことを意味する。メーカーによって測定されるかかる電荷質量比は各現像モジュールに取り付けられたメモリチップ40に記憶することができる。初期化が行なわれると、プリンタはそのプリンタ内の多数の設定を調整して期待される範囲から外れた電荷対質量比を補償する（たとえば、トナー・キャリヤ比の変更、ドラムのバイアス設定の変更、レーザー出力の設定あるいは現像器バイアス設定の変更などを行なう。）

【0025】最新のセンサーデータを受け取り、必要な計算を行なうと、制御コンピュータは新しい使用状態データおよび/または校正データをそれぞれのメモリチップ40に書き込み、それらのメモリ状態を更新する。したがって、ある交換可能部品が第1のプリンタから第2のプリンタに移されると、第2のプリンタ内の制御コンピュータ28がイネーブルされてこの新たに置換された交換可能部品の使用状態データおよび校正データにアクセスし、それにしたがってその動作状態を精密に調整する。

【0026】【インクジェットプリンタ】図4および図5に示すように、インクジェットプリントカートリッジ60はインクを収容する内部インク溜め62を有する。液体連通管64によってレセプタクル66がカートリッジ60からインクを受け取ることができる。また、レセプタクル66内のアクチュエータ（図示せず）にダイヤフラム68が連通されてインク溜め62に加圧する。電気接続部70が回路基板74上の少なくとも1つの接点(contact land) 72と接続する。シリアルメモリチップ76（図5）が回路基板74上に設けられ、保護膜78に覆われている。メモリチップ76は単一のアクセス線を介したデータの入出力が可能である。インクカートリッジ60はキー機構80を有し、これらはレセプタクル66の他のキー機構と係合し、インクカートリッジ60が適正なインク色のものであり、そのプリンタシステムに適合するインクを保持しており、適正な向きに位置決めされる場合にのみインクカートリッジ60を挿入しうるようになる。レセプタクル66は導管84を介してインクジェットベン82に液通している。インクジェットベン82およびレセプタクル66はいずれもこのインクジェットプリンタの動作を制御するマイクロプロセッサ86に電気的に接続されている。

【0027】周知のように、インクジェットベン82の動作はプリンタドライバから得られるさまざまなパラメータにしたがってマイクロプロセッサ86によって制御される。かかるパラメータには、デフォルトインク射出周波数（すなわち、高品質モード、原稿モード）、個々の加熱抵抗器に印加される信号のパルス幅を決めるパラメータ、印刷動作時のプリントヘッドの温度を最適化および安定化させるためのプリントヘッドへの予熱電流の量を制御するためのパラメータ、1画素あたりに射出されるインク滴の数を指定するパラメータ、サービスステーシ

ョン用パラメータ、印刷モードデータ（すなわち、プリンタに指定された印刷品質と印刷状態を達成させるパラメータ）、および使用インク量およびインク残量の判定を可能にするパラメータ等がある。

【0028】パルス幅パラメータはサーマルインクジェット抵抗器の点弧エネルギーを決定する、これは印加電圧が通常一定であるためである。予熱電流を制御するパラメータは基板温度したがってインク滴の量の制御を可能とする。この予熱電流を変調することによって、印刷品質のばらつきを生じさせるインク滴量の変動を防止することができる。印刷モードパラメータはドット配列の形状を制御する。

【0029】上述したパラメータおよび手順の少なくとも一部は、プリンタドライバに加えてメモリチップ76にも記憶される。印刷ジョブが開始されるたびに、マイクロプロセッサ86はメモリチップ76の内容を調べ、このアクセスされたデータにしたがってプリンタドライバに記憶されたパラメータを変更する。その後、インクジェットプリンタはかかるパラメータにしたがって既知の態様で動作可能となる。

【0030】本発明の重要な特徴は、インクカートリッジ60がインクジェットプリンタにおいて最も頻繁に交換されるユニットであるという点にある。したがって、プリンタに対する設計変更の結果パラメータの変更あるいはアルゴリズムの修正が必要になった場合、インクカートリッジ60の製造後に修正されたパラメータをメモリチップ76に入れることができる。その後ユーザーがカートリッジ60を購入しインクジェットプリンタに入れると、変更されたパラメータのすべてが自動的にマイクロプロセッサ86によって利用可能になり、修正されたプリンタドライバを特別の方法で配付することなくそのインクジェットプリンタの動作を更新することができる。その結果、交換用のインクジェットカートリッジ60を購入するだけで、すべての設置済みのインクジェットプリンタが短期間で最新のパラメータおよびアルゴリズムのセットに更新される。

【0031】メモリチップ76に記憶されるパラメータデータには、カートリッジから放出されるインク滴の実カウント値、インク入れの日付コード、インクカートリッジの最初の押入日付コード、システム係数、インクのタイプ/色、カートリッジのサイズ、印刷モード、温度データおよび加熱抵抗器のパラメータ、カートリッジの製造後年数、プリントヘッドのインク滴カウント値、ポンピングアルゴリズム、プリンタのシリアルナンバー、カートリッジの使用状態の情報その他がある。

【0032】かかるデータによってマイクロプロセッサ86はインクジェットプリンタ内の多数の制御機能を実行することができる。たとえば、マイクロプロセッサ86はカートリッジ60内のインク残量の概算を計算し、この概算値をあらかじめ記録された供給しきい値と比較する。

インクが全容量の25%未満である場合、ユーザーにこれを知らせるメッセージが表示される。さらに、この残った25%のインクのかなりの部分が消費されると、マイクロプロセッサ86はインクジェットプリンタを動作停止とすることができ（またさらにユーザーがこの停止を無効にすることができる）、同時にかかる無効化をメモリチップ76に記録する。

【0033】メモリチップ76に記憶されるデータによって、マイクロプロセッサ86はさらに適切なタイプと色のインクが設置されているかどうかを判定し、ユーザーに可能な保管寿命切れに関する警報を発し、さらに、ユーザーにそのインクの使用に対する警報を発することができる。このメモリにインク入れ識別子をコード化することによって、プリンタはそのインク入れがインク切れになる時期を判定することができる。したがって、プリンタはその動作を連続的実行しながらではなく、適宜な時点でインク切れの判定を試みることができる。

【0034】印刷ジョブの開始に先立つインク切れの検出機能、低インク量の警告機能、およびプリンタフィードバック機能について説明すると、プリンタはインクカートリッジの（パラメータの中から）インク入れのサイズを読み出す。プリンタはこの読み出したパラメータを消費インク量の概算値と比較する。（ある特定の色の）カートリッジが最初に使用されるとき、プリンタはインク滴の量について保守的な（大きい）値を仮定しなければならない。その後、プリンタ/コンピュータはインクレベルが低いと判断すると、スピトゥーンにインクを射出し、温度検出抵抗器（TSR）から温度上昇を検出する。この温度はインク入れが空になりかかっているとき、より急激に上昇する傾向がある。インク入れが実際に空になると、プリンタはこの情報を用いてインク滴量を計算し直す。このようにして、プリンタは“学習”し、インク滴をより正確にカウントするようになる。この情報の保守的な使用方法としては、この計算値と初期の保守的なインク適量値の中間点を取る方法がある。時間が経つにつれて、インク滴のカウントに用いられる値は、使用されるすべてのインク入れの計算値に近づく。さらに、インク滴量がより良好に制御され把握されるようになるにつれて、メモリにプログラムされた初期の保守的なインク適量の概算値を更新することができる。

【0035】プリンタシリアルナンバーおよび使用状態情報について説明すると、プリンタは使用状態のタイプ（平均印刷密度その他）を記録するデータを更新することができる。使用済みカートリッジのメールインプログラムからメーカーはプリンタの使用状態に関するマーケティング情報を収めることができ。この情報から、チップ上のパラメータをさらに最適化することができる。プリンタの使用状態情報を記憶する方法の一つに、平均印刷密度と各印刷ページの消費インク量に関する情報を記憶する方法がある。図形とテキストの割合等の他

の量を記憶することもできる。次に、プリンタドライバは、インク入れの寿命切れが近づいたとき、この情報を圧縮し、カートリッジ上の1連の数字として記憶する。

【0036】カートリッジ上のドット位置決め修正アルゴリズムの記憶について説明すると、インクジェットペルの生産に関する情報が増えるほど、ドット位置決め誤差を修正するより精密な方法を得ることができる。たとえば、走査方向には、ノズルからの飛しょう軌跡のばらつきによってドットの位置決めにばらつきが生じる。かかるばらつきはSAD（Scan Axis Directionality、走査軸方向付け）誤差として知られている。かかるばらつきはノズルの射出タイミング（カートリッジ上のパラメータの1つである）を変更することによって補償することができる。カートリッジを作動させるインクポンプには疲労による故障が生じる可能性がある。したがって、カートリッジ上にポンプの往復動数を記録することによって、かかる故障を予測することができる。ポンプが使用過多になると、インクのこぼれを防止するためにポンピングが低減あるいは停止される。したがって、最大スループット（ml/分）を小さくしてポンピングの低減あるいは停止の調整を行なうことができる。さらに、製造技術の向上とともにポンプ寿命も改善される可能性があるため、カートリッジに記録されるポンプ寿命の概算値を更新することができる。

【0037】加熱抵抗器のインバルス当たりのインク滴量はシステムパラメータに依存するアルゴリズムによって判定することができるため、修正されたパラメータによってインク滴量の計算を最適化することができる。かかるパラメータはプリンタの寿命全体にわたって継続的に更新することができるため、新しいインクカートリッジが設置されるとき最適な印刷品質を得ることができる。さらに、パルス幅、パルス加熱エネルギー、画素当たりのインク滴数のばらつきその他はすべてシステムの改善にしたがって変更および制御することができる。

【0038】図6に示す論理図はインクジェットプリンタとメモリチップ76に記憶されたデータとの相互作用を示す。電源投入時あるいは印刷ジョブの開始時（判断100）に、システムパラメータがインクカートリッジのメモリチップ76から読み出される（102）。これらのパラメータはプリンタドライバのデフォルトパラメータの更新に用いられ（104）、プリンタはその後、デフォルトのパルス幅、パルス加熱エネルギー、射出周波数、およびインク滴カウント値を用いて印刷品質を制御する（106）。

【0039】印刷の進行につれて、マイクロプロセッサ86はインク滴量係数、インク滴カウント値、および温度測定値を用いてインク使用量を見積もる。メモリチップ76内のインク使用量は周期的に更新され（108）、インク入れが過少になったことがわかると（判断110）ユーザーに警告メッセージが示される。あるいは印刷ジョブ

がその後停止される（これはユーザーによって無効化されることがある）（112）。印刷ジョブが完了すると（判断114）、インクジェットプリンタの次の動作に備えて修正されたパラメータがメモリチップ76に書き込まれる（116）。

【0040】図7にはこのプリンタに用いられる、インクカートリッジから得られるインク使用状態パラメータに関する手順をさらに詳細に示す。

【0041】以上、本発明の実施例について詳述したが、以下、本発明の各実施態様の例を示す。

【0042】【実施態様1】交換可能なインクカートリッジ（60）であって、インクジェットプリンタを制御するプロセッサ手段（86）を含むインクジェットプリンタのインクジェットプリントヘッド（82）用の交換可能なインクカートリッジ（60）であり、前記インクジェットプリンタは前記インクカートリッジ（60）を受けるレセプタクル（66）を含み、前記レセプタクル（66）は前記プロセッサ手段（86）に結合された第1のコネクタ手段（70）を含み、前記インクカートリッジ（60）は以下（a）ないし（d）を含むことを特徴とする。

（a）インクを保持するインク溜め（62）。  
（b）前記インクカートリッジ（60）が前記レセプタクル（66）に挿入されると前記第1のコネクタ手段（70）と係合する第2のコネクタ手段（76）。

（c）前記インクカートリッジ（60）が前記レセプタクル（66）に挿入されると前記インク溜め（62）を前記インクジェットプリントヘッド（82）に接続する液通手段（64、84）。

（d）前記第2のコネクタ手段（76）に接続され、1本のデータ入出力線（42）のみを有し、これによって前記プロセッサ手段（86）にとってアクセス可能となるシリアルアクセスマモリ（40）であって、少なくとも前記インク溜め（62）内のインクの使用状態を示すデータを記憶するシリアルアクセスマモリ（40）を含む。

【0043】【実施態様2】実施態様1に記載の交換可能なインクカートリッジ（60）であって、前記シリアルアクセスマモリ（40）は前記インクジェットプリンタのための修正されたパラメータデータを含むことを特徴とする交換可能なインクカートリッジ（60）。

【0044】【実施態様3】実施態様2に記載の交換可能なインクカートリッジ（60）であって、前記修正されたパラメータデータが前記プロセッサ手段（86）によってアクセスされると、前記プロセッサ手段（86）は前記修正されたパラメータデータと他のデータを組み合わせて前記インクジェットプリンタおよびインクジェットプリントヘッド（82）に対する制御信号を生成することができることを特徴とする交換可能なインクカートリッジ（60）。

【0045】【実施態様4】実施態様1に記載の交換可能なインクカートリッジ（60）であって、前記シリアル

アクセスマモリ（40）は前記インクカートリッジ（60）を表わすシリアルナンバーを記憶し、前記プロセッサ手段（86）は記憶されたデータを有し、前記シリアルアクセスマモリ（40）から読み出した前記シリアルナンバーを読み出し、それを前記記憶されたデータと比較することによって前記インクカートリッジ（60）の同定が可能となることを特徴とするインクカートリッジ（60）。

【0046】【実施態様5】実施態様1に記載の交換可能なインクカートリッジ（60）であって、前記シリアルアクセスマモリ（40）は単一の電線のみによって前記第2のコネクタ手段（76）に接続されることを特徴とするインクカートリッジ（60）。

【0047】【実施態様6】インクジェットプリンタであって、以下（a）ないし（d）を含むことを特徴とする。

（a）前記インクジェットプリンタを制御するプロセッサ手段（86）。

（b）インクジェットプリントヘッド（82）。

（c）レセプタクル（66）であって、使い捨て可能なインクカートリッジ（60）を受け、前記インクジェットプリントヘッド（82）に被通し、前記プロセッサ手段（86）に結合された第1のコネクタ手段（70）を含むレセプタクル（66）。

（d）使い捨て可能なインクカートリッジ（60）であって、前記レセプタクル（66）に係合する形状を有し、インクを保持するインク溜め（62）、前記インクカートリッジ（60）が前記レセプタクル（66）に挿入されると前記第1のコネクタ手段（70）に係合する第2のコネクタ手段（76）、前記インク溜め（62）を前記レセプタクル（66）内の液通手段（84）に接続する液通手段（64）、およびシリアルアクセスマモリ（40）であって、前記第2のコネクタ手段（76）に接続され1本のデータ入出力線（42）のみを有し、前記プロセッサ手段（86）によってアクセス可能であって、少なくとも前記インク溜め（62）内のインクの使用状態を示すデータを記憶するシリアルアクセスマモリ（40）を含む使い捨て可能なインクカートリッジ（60）。

【0048】【実施態様7】実施態様6に記載のインクジェットプリンタであって、前記シリアルアクセスマモリ（40）は前記インクジェットプリンタのための修正されたパラメータデータを含むことを特徴とするインクジェットプリンタ。

【0049】【実施態様8】実施態様7に記載のインクジェットプリンタであって、前記修正されたパラメータデータが前記プロセッサ手段（86）によってアクセスされると、前記プロセッサ手段（86）は前記修正されたパラメータデータと他のデータを組み合わせて前記インクジェットプリンタおよびインクジェットプリントヘッド（82）に対する制御信号を生成することができることを特徴とするインクジェットプリンタ。

【0050】〔実施態様9〕実施態様6に記載のインクジェットプリンタであって、前記シリアルアクセスマモリ(40)は前記インクカートリッジ(60)を表わすシリアルナンバーを記憶し、前記プロセッサ手段(86)は記憶されたデータを有し、前記シリアルアクセスマモリ(40)から読み出した前記シリアルナンバーを読み出し、それを前記記憶されたデータと比較することによって前記インクカートリッジ(60)の同定が可能となることを特徴とするインクジェットプリンタ。

【0051】〔実施態様10〕インクジェットプリンタの動作方法であって、前記プリンタはプロセッサ手段(86)、インクジェットプリントヘッド(82)、使い捨て可能なインクカートリッジ(60)を受ける前記インクジェットプリントヘッド(82)に結合されたレセプタクル(66)を含み、前記レセプタクル(66)はさらに前記プロセッサ手段(86)に結合された第1のコネクタ手段(70)を含み、前記動作方法は以下(a)ないし(c)のステップを含むことを特徴とする。

(a) 前記レセプタクル(66)に使い捨て可能なインクカートリッジ(60)を挿入するステップであって、前記カートリッジ(60)はインクを保持するインク溜め(62)、前記第1のコネクタ手段(70)に係合する第2のコネクタ手段(76)、前記インク溜め(62)を前記レセプタクル(66)内の液通手段(84)に接続する液通手段(64)、およびシリアルアクセスマモリ(40)であって、前記第2のコネクタ手段(76)に接続され前記カートリッジ(60)が前記レセプタクル(66)に挿入されると前記プロセッサ手段(86)にとってアクセス可能となるシリアルアクセスマモリ(40)を含む。

(b) 印刷ジョブの開始時での前記プロセッサー手段の動作ステップであって、前記メモリ(40)に記憶されたデータから、(i)前記レセプタクル(66)内にカートリッジ(60)が動作可能に存在しているかどうか、(ii)前記カートリッジ(60)の識別、および(iii)前記プリンタを制御するためのパラメータ値を判定し、前記パラメータ値を用いて前記プリンタ内にすでに存在する対応するパラメータ値を更新するステップ。

(c) 前記印刷ジョブの完了時での前記プロセッサー手段の動作ステップであって、前記メモリ(40)に記憶されたデータを、前記インク溜め(62)内のインク残量の判定を可能とする修正値を書き込むことによって更新するステップ。

【0052】〔実施態様11〕実施態様10に記載の方法であって、ステップ(c)において、前記プロセッサ手段(86)は前記プリンタ内の他の場所で得られたデータにしたがって前記シリアルアクセスマモリ(40)への修正パラメータの書き込みを行なうことを特徴とする方法。

【0053】〔実施態様12〕交換可能なインクカートリッジ(60)であって、インクジェットプリンタを制御するプロセッサ手段(86)を含むインクジェットプリンタ

のインクジェットプリントヘッド(82)用の交換可能なインクカートリッジ(60)であって、前記インクジェットプリンタは前記インクカートリッジ(60)を受けるレセプタクル(66)を含み、前記レセプタクル(66)はインクジェットプリントヘッド(82)に液通し、さらに前記プロセッサ手段(86)に結合された第1のコネクタ手段(70)を含み、前記インクカートリッジ(60)は、以下の(a)ないし(d)を含むことを特徴とする。

- (a) インクを保持するインク溜め(62)。
- (b) 前記インクカートリッジ(60)が前記レセプタクル(66)に挿入されると前記第1のコネクタ手段(70)と係合する第2のコネクタ手段(76)。
- (c) 前記インクカートリッジ(60)が前記レセプタクル(66)に挿入されると前記インク溜め(62)を前記インクジェットプリントヘッド(82)に接続する液通手段(64)。
- (d) シリアルアクセスマモリチップ手段(40)であって、前記第2のコネクタ手段(76)に接続され、それによって前記プロセッサ手段(86)にとってアクセス可能となり、前記インク溜め(62)内のインクの使用状態を示すデータ、さらに前記インクジェットプリントヘッド(82)の動作を制御するためのパラメータを示すデータを記憶するシリアルアクセスマモリチップ手段(40)。

【0054】〔実施態様13〕実施態様12に記載の交換可能なインクカートリッジ(60)であって、前記インクジェットプリントヘッド(82)の動作を制御するための前記パラメータデータが前記プロセッサ手段(86)によってアクセスされると、前記プロセッサ手段(86)は前記パラメータと他のデータを組み合わせて前記インクジェットプリンタおよびインクジェットプリントヘッド(82)に対する制御信号を生成することができる特徴とするインクカートリッジ(60)。

【0055】〔実施態様14〕インクジェットプリンタであって、以下(a)ないし(d)を含むことを特徴とする。

- (a) 前記インクジェットプリンタを制御するプロセッサ手段(86)。
- (b) インクジェットプリントヘッド(82)。
- (c) 使い捨て可能なインクカートリッジ(60)を受けるレセプタクル(66)であって、前記インクジェットプリントヘッド(82)に液通し、前記プロセッサ手段(86)に結合された第1のコネクタ手段(70)を含むレセプタクル(66)。
- (d) 使い捨て可能なインクカートリッジ(60)であって、前記レセプタクル(66)に係合する形状を有し、インクを保持するインク溜め(62)、前記インクカートリッジ(60)が前記レセプタクル(66)に挿入されると前記第1のコネクタ手段(70)に係合する第2のコネクタ手段(76)、前記インク溜め(62)を前記レセプタクル(66)内の液通手段(84)に接続する液通手段(64)。

およびシリアルアクセスメモリ(40)であって、前記第2のコネクタ手段(76)に接続され、それによって前記プロセッサ手段(86)にとってアクセス可能となり、前記インク溜め(62)内のインクの使用状態を示すデータ、さらに前記インクジェットプリントヘッド(82)の動作を制御するためのパラメータを示すデータを記憶するシリアルアクセスメモリ(40)を含む使い捨て可能なインクカートリッジ(60)。

【0056】〔実施態様15〕実施態様14に記載のインクジェットプリンタであって、前記インクジェットプリントヘッド(82)制御するための前記パラメータが前記プロセッサ手段(86)によってアクセスされると、前記プロセッサ手段(86)は前記パラメータデータと他のデータを組み合わせて前記インクジェットプリンタおよびインクジェットプリントヘッド(82)に対する制御信号を生成することができることを特徴とするインクジェットプリンタ。

【0057】〔実施態様16〕媒体シート上に印刷を行なう装置であって、消耗する交換可能な部品あるいは前記装置の動作時に用いられる消耗品を含む交換可能な部品を受けるように適合され、前記装置を制御するプロセッサ手段(86)、交換可能な部品(60)を受けるためのレセプタクル(66)および前記1つのレセプタクル(66)に関係付けられ、前記プロセッサ手段(86)に結合された第1のコネクタ手段(70)を含む装置において、前記交換可能な部品(60)は、以下の(a)および(b)を含むことを特徴とする。

(a) 前記第1のコネクタ手段(70)に係合する第2のコネクタ手段(76)。

(b) シリアルアクセスメモリ(40)であって、1本のデータ入出力線(42)によって前記第2のコネクタ手段(76)に接続され、少なくとも前記交換可能な部品(60)の使用状態を示すデータを記憶するシリアルアクセスメモリ(40)を含み、前記プロセッサ手段(86)は前記シリアルアクセスメモリ(40)に対するデータの書き込みと読み出しの両方を行なうことができることを特徴とする装置。

【0058】〔実施態様17〕実施態様16に記載の装置であって、前記シリアルアクセスメモリ(40)はさらに前記装置のための校正データを記憶し、前記プロセッサ手段(86)は前記校正データにアクセスし、前記校正データと他のデータを組み合わせて前記装置のための制御信号の発生を可能にするよう制御されることを特徴とする装置。

【0059】〔実施態様18〕実施態様16に記載の装置であって、前記シリアルアクセスメモリ(40)は前記交換可能な部品(60)を表わすシリアルナンバーを記憶し、前記プロセッサ手段(86)は記憶されたデータを有し、前記シリアルアクセスメモリ(40)から読み出した前記シリアルナンバーを読み出し、それを前記記憶されたデ

ータと比較することによって前記交換可能な部品(60)の同定が可能となることを特徴とする装置。

【0060】〔実施態様19〕実施態様16に記載の装置であって、前記シリアルアクセスメモリ(40)は定着アセンブリに接続され、内蔵されたシリコーンオイル入れの過去の使用履歴に関するデータを有し、前記プロセッサ手段(86)は透明媒體シートがそれに接触した状態で通過しようとしていることを判定すると、前記過去の使用履歴に関するデータに応じて前記定着アセンブリの温度を修正することを特徴とする装置。

【0061】〔実施態様20〕実施態様16に記載の装置であって、前記シリアルアクセスメモリ(40)は現像モジュールに接続され、前記現像モジュールに入ったトナーキャリヤの電荷質量比を規定するパラメータを記憶し、前記プロセッサ手段(86)は前記パラメータを用いて前記装置内の他の手段の設定を修正して前記電荷質量比パラメータを補償することを特徴とする装置。

【0062】〔実施態様21〕実施態様16に記載の装置であって、前記シリアルアクセスメモリ(40)は現像モジュールに接続され、現像器の磁石の強度および前記現像モジュールの面と感光ドラムの間の距離を規定するパラメータを記憶し、前記プロセッサ手段(86)は前記パラメータを用いて前記装置内の他のパラメータの調整を可能としてそれを補償することを特徴とする装置。

【0063】以上の説明は本発明を例示するものに過ぎないものと理解されたい。当業者には本発明から逸脱することなくさまざまな代替的態様や変形態様の考案が可能であろう。したがって、本発明は特許請求の範囲に該当するかかる代替的態様、変形態様および変更態様のすべてを含むものである。

#### 【図面の簡単な説明】

【図1】 各交換可能部品が1本の直線によってインターフェースコネクタに接続された一体化ヒューズを有する従来技術装置のブロック図である。

【図2】 本発明を示すブロック図である。

【図3】 オンボードシリアルアクセスメモリのための単線相互接続を示す、交換可能部品のインターフェース部の詳細を示す図である。

【図4】 インクジェットプリンタの交換可能なインクカートリッジの斜視図である。

【図4A】図4の回路基板の拡大図である。

【図5】 図4のインクカートリッジをインクジェットプリントヘッドに接続し、さらにインクカートリッジに設けられたメモリチップへの接続を行なうための装置を示す概略図である。

【図6】 インクカートリッジに記憶されたデータにしたがった図5のプリンタシステムの動作を示す論理フロー図である。

【図7】 インクカートリッジに記憶されたインク使用状態データにしたがった図5のプリンタシステムの動作

を示す論理フロー図である。

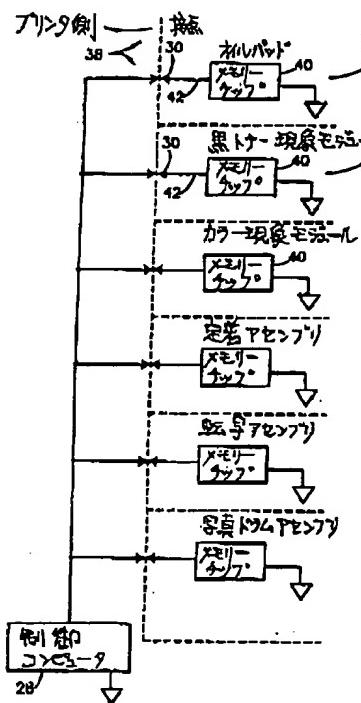
【符号の説明】

- 10: インターフェース
- 12: オイルパッドモジュール
- 14: 黒(K)トナー現像モジュール
- 16: カラー現像モジュール
- 18: 定着アセンブリ
- 20: 転写アセンブリ
- 22: 写真ドラムアセンブリ
- 24: ヒューズ
- 26: ヒューズ溶断回路モジュール
- 28: 制御コンピュータ
- 30: 接点
- 32: アース接続
- 36: レセプタクル
- 38: プリンタ
- 40: メモリチップ
- 42: 電線
- 50: 交換可能部品

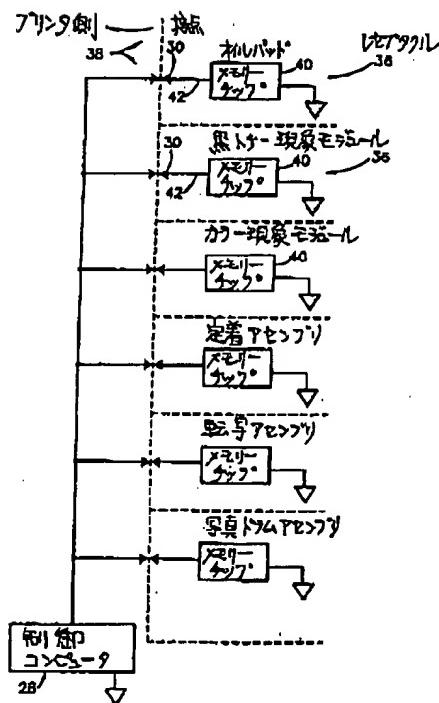
52: コネクタ

- 54: インターフェースボード
- 56: 電子部品モジュール
- 58: メモリ線
- 60: インクジェットプリントカートリッジ
- 62: インク溜め
- 64: 液体連通管
- 66: レセプタクル
- 68: ダイヤフラム
- 70: 電気接続部
- 72: 接点
- 74: 回路基板
- 76: シリアルメモリチップ
- 78: 保護膜
- 80: キー機構
- 82: インクジェットプリントヘッド
- 84: 導管
- 86: マイクロプロセッサ

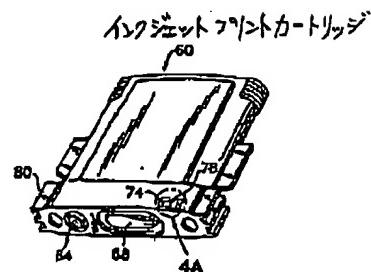
【図1】



【図2】



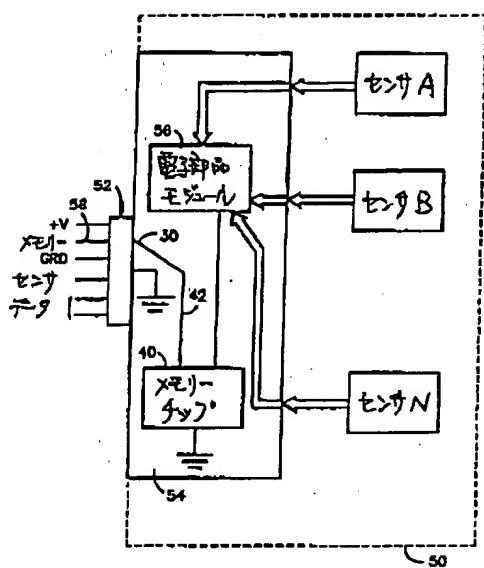
【図4】



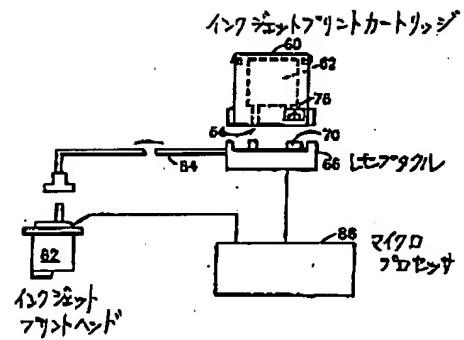
【図4A】



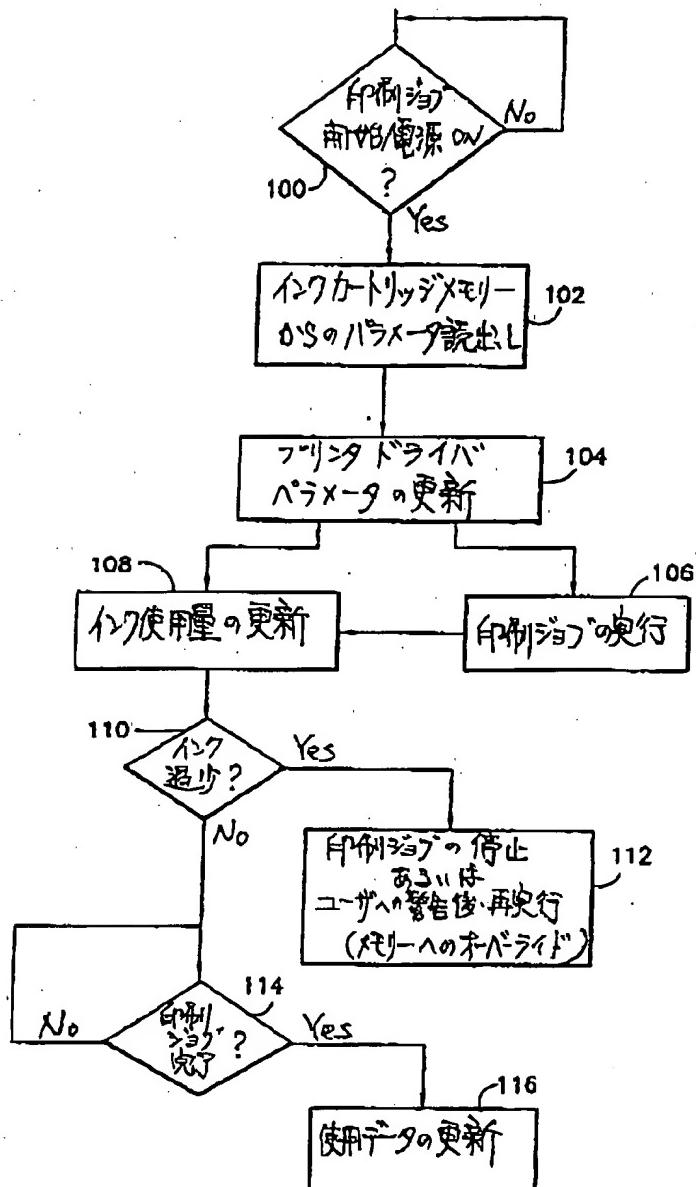
〔图3〕



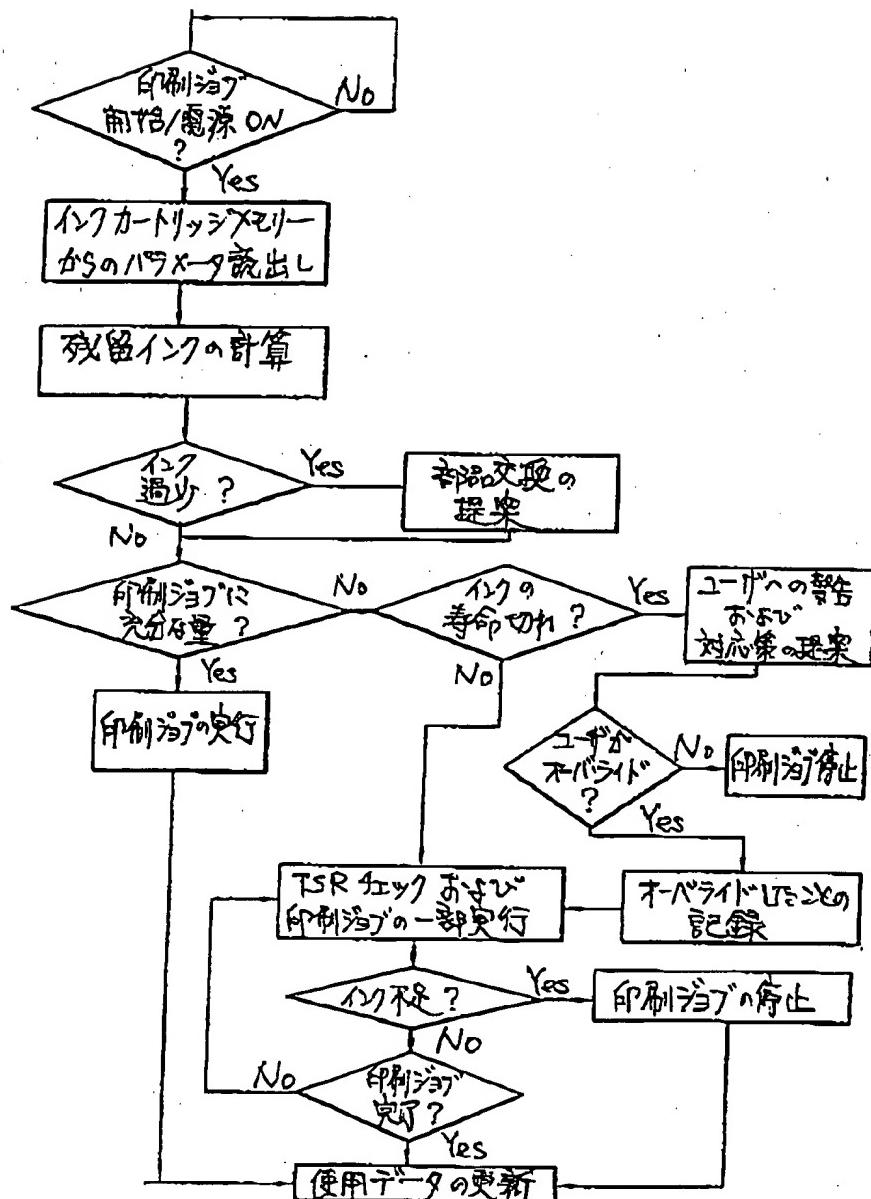
〔图5〕



【図6】



【図7】



フロントページの続き

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  2. \*\*\*\* shows the word which can not be translated.
  3. In the drawings, any words are not translated.
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CLAIMS

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[Claim(s)]

[Claim 1] It is an exchangeable ink cartridge, and it is an exchangeable ink cartridge for the ink jet print heads of an ink jet printer including a processor means to control an ink jet printer, and is characterized by said ink cartridge containing (a) thru/(d) below including 1st connector means by which said receptacle was combined with said processor means, including the receptacle in which said ink jet printer receives said ink cartridge.

- (a) The ink reservoir holding ink.
  - (b) The 2nd connector means which will engage with said 1st connector means if said ink cartridge is inserted in said receptacle.
  - (c) A \*\*\* means to connect said ink reservoir to said ink jet print head if said ink cartridge is inserted in said receptacle.
  - (d) It connects with said 2nd connector means, and has only one data input output line, and it is the serial access memory which becomes accessible for said processor means by this, and the serial access memory which memorizes the data in which the busy condition of the ink in said ink reservoir is shown at least is included.
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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] It reaches and this invention relates to the consumables and the supply components which have the unification memory for memorizing busy condition data, calibration data, and other data in a detail more about exchangeable consumables and the equipment using supply components.

[0002]

[Description of the Prior Art] The latest copying machine, a printer, and a plotter and others have the control microprocessor which needs the input calibration data for internal configuration elements, in order to draw up a document quality almost altogether. Although most of these equipments are constituted so that a user can exchange articles

of consumption, the user (or serviceman) who performs exchange has to perform the input of busy condition data and calibration data. If an error is in the input of calibration data, the engine performance of equipment may fall greatly or may turn into impossible of operation.

[0003] About the judgment of the busy condition of consumables, the conventional technique was restricted to simple record input extent for generally telling a user about the required stage of exchange. For example, the copying machine enables the processor to maintain the display of output pagination, and internal record of the engine speed of a drum (or organic sensitization web), and to tell the required stage of service or exchange by signal in many cases.

[0004] The exchangeable development module is used for electrophotography-type a current printer and a current copying machine many. Each development module has a toner, a toner carrier, and a device for sending the mixture of a toner and a carrier to a drum (or web) side further. In order to obtain the proper control signal level for a laser exposure system, a control microprocessor adjusts the ratio of a toner and a carrier so that suitable mixture can be obtained. There is a method of preparing the oscillator circuit where the frequency changes with toner-carrier ratios as the control approach of a toner pair carrier ratio. In it, sufficient data which can judge a toner-carrier ratio from this oscillator circuit are stored, covering it for many minutes at the time of attachment of a new development module, and it enables it to set up proper signal level in a laser exposure system at it. If a development module is picked out from equipment or is moved to other equipments, this whole calibration procedure must be repeated and performed.

[0005] Although the printer and the copying machine had counted output pagination conventionally as mentioned above, the difference of whenever [ exhausting / which is produced by the difference in a medium type ] is not reflected in the starting simple page counted value. For example, if about 80,000 pages are printed by the standard medium type for a fixing (platen roller of pair with which the one side or both are heated is included) assembly, a surface breakdown device phenomenon will arise. Dispersion arises in consumption of a fixing assembly and this dispersion is not reflected in simple page counted value by difference of a medium type.

[0006] Saturation is raised to the fixing assembly used for a color printer, and the silicone oil for giving gloss to the medium after printing is used. The amount of the oil applied must be changed with a medium type. The control system for judging the amount of the oil which a fixing assembly should get to know a medium type, and should apply is formed. Although a processor records the amount of accumulation used of oil, when a fixing assembly is removed or the stored data about an oil busy condition is lost, in case a fixing assembly is used again, there is no approach of reconstructing this busy condition.

[0007] Similarly, an electrophotography type drum has the sensitization layer which shows predetermined charge sensibility. The data of this charge sensibility are used as a control parameter of the power control loop of a laser exposure system. Conventionally,

these charge sensibility data were inputted by the operator. However, if a drum is moved between printers so that it may see at the time of service, these data cannot be moved with a drum but must be reinputted.

[0008] The print head of throwing away which has unified ink ON \*\* is used for an ink jet printer. In the disposable printing assembly indicated in the U.S. Pat. No. 5,049,898 number of Arthur transferred to the same grantee as this application, and others, the data which describe the description of the assembly to a unification memory element are memorized. Arthur and others offered the ink jet print head assembly which has the memory which specifies the location of the color of the ink in a print head, its amount, and the ink jet orifice plate on a print head body. These data are read from a print head with read-out / write-in element in a printer, and are used or displayed if needed.

[0009] Many parameters (from the installed printer driver) for operating a print head with high dependability, and enabling continuous generation of the print job of high quality are used for an ink jet printer. A heating resistor is used for each of an ink jet orifice which injects one or the ink droplet beyond it by energizing in a thermal ink jet print head as everyone knows. In order to obtain the amount of a desired ink droplet, the amount of currents impressed to a heating resistor is decided by combination of some factors, and this is as a result of [ of a certain algorithm ] count. The amount of an ink droplet is decided by the structure and others of detection temperature, the constant reflecting the property of ink, and an ink orifice. This parameter is supplied to a power up from a printer driver at an ink jet printer.

[0010] When judging that correction is required in the parameter which requires a manufacturer, a manufacturer has to publish the updating version of a printer driver, and he has to take a measure so that this may be supplied to both the past purchaser and a new purchaser. Furthermore, when changing while manufacturing the design of a print head, modification of a parameter is needed for this modification in many cases. Also in this case, a new printer driver is needed.

[0011]

[Problem(s) to be Solved by the Invention] It unites with it and many of substitute parts [ exhausting ] for a printer or copying machines have the fuse in which it is shown whether the substitute part is a new article or it is a used thing. If a control microprocessor judges with the fuse not flying at the time of insertion of a substitute part, a machine will judge that the substitute part is a new article, and will make zero counted value which shows the estimated usable period of the component. It indicates that the data applied to a user on a control panel are required for a microprocessor when input data is still more nearly required about a substitute part, or (like [ the toner pair carrier ratio in a development module / of a case ]) the data are automatically collected from a substitute part sensor. Then, a fuse is flown.

[0012] The circuit by the conventional technique which starts for electro-photographic printers is shown in drawing 1 . In this circuit, plug connection of each of two or more consumption components is made with an interface 10 at the printer. There are the oil

pad module 12, (Black K) toner development module 14, the color development module 16, the fixing assembly 18, the imprint assembly 20, and photograph drum assembly 22 grade in this article of consumption by which plug connection is made. It will be understood by this contractor that there are consumables in which the plug connection with a printer other than above-mentioned consumables is possible. Each consumables have the fuse 24 melted with the fuse fusing circuit module 26, when the proofreading actuation by the control computer 28 is completed. A fuse 24 is built into each structure of a substitute part, and is connected to the contact 30 of the multiple contact connector which interfaced with the connector in a printer through one electric wire. The circuit which passes a fuse 24 by the ground connection 32 in a substitute part is completed.

[0013] The purpose of this invention is offering the exchangeable components / consumables which has the unification memory in which storage and modification of both busy condition data and calibration data are possible.

[0014] Other purposes of this invention are offering the exchangeable components / consumables which has the memory module which does not need modification to the existing physical interface between the component and the equipment which attaches it.

[0015]

[Means for Solving the Problem] Ink jet printing / reproducing unit holds the exchange ink cartridge used for printing/copy actuation. This equipment has the receptacle which has the 1st connector combined with the processor which controls actuation of the equipment. A cartridge has the 2nd connector and this connector engages with the memory connected to the 1st connector and this 2nd connector. Both the data transfer from this memory and the data transfer to this memory are possible, and access and modification to the data showing the parameter for controlling the busy condition of a cartridge, proofreading, and actuation of equipment memorized by this at memory are possible. The direct permutation of memory is possible instead of the fuse prepared by use of the serial access memory on a cartridge now, without adding modification to the physical interface between the cartridge-connectors which enable engagement to the equipment of a cartridge and a cartridge by this although the I/O on one electric wire is possible.

[0016]

[Example] Although this invention is explained with reference to an electro-photographic printer and an ink jet printer below, this invention is applicable to the equipment with which computer control of the arbitration which has exchangeable components / consumables was carried out.

[0017] This invention enables storage of the busy condition data to the single track memory module by which internal organs are carried out to exchangeable components, and calibration data. Therefore, when exchangeable components are moved from the 1st equipment to the 2nd equipment, according to the data memorized by the onboard memory of this component in the 2nd equipment, adjustment of that control parameter is

possible. This is important especially when the data from exchangeable components must be made to correlate with other data, in order to generate a device control signal. For example, if the humidity data detected within a printer are combined with the sensibility data of a photo conductor, they will affect an exposure setup of laser directly. If mistaken photo conductor sensibility data are used, a bad influence will appear in the engine performance of a printer.

[0018] Recently, single track I/O serial memory is marketed increasingly. As this kind of memory, there is DS1992-DS1995 Touch Memory series of Dallas Semi-Conductors Inc. Such memory is constituted as non-volatile random access memory which has the storage capacity of 1K to 16 K bytes, respectively. In the case of DS1992, 128 bytes of internal nonvolatile RAM is constituted as a scratch pad which are four storage regions which are 32 bytes each, and 32 bytes. I/O of the data from this single track memory is performed by the protocol using the pulse of various die length showing the beginning of read-out / write-in actuation. A transfer of bitwise is performed after these pulses and 1 and 0 are expressed with different pulse duration in this transfer. Serial input/output memory other than this can also be used for this invention.

[0019] As shown in [electro-photographic printer] drawing 2, each exchangeable components / consumables engage with the receptacle 36 (shown briefly) in a printer 38. The fuse shown in drawing 1 is transposed to the memory chip 40, respectively, it connects with the existing connector 30 through an electric wire 42, and this memory chip can memorize both the busy condition data about exchangeable components, and calibration data. The interface of the exchangeable components 50 within a printer and a connector 52 is further shown in a detail at drawing 3. The exchangeable components 50 have two or more sensor A-N which interconnected with the interface board 54 by which the single track memory chip 40 and the electronic-parts module 56 were attached. (not shown [ the great portion of interconnect on a board 54 ] in order to simplify a drawing) Sensor A-N supplies a signal to the electronic-parts module 56, and this module gives an interface function to a connector 52, connected various control lines, and a detection line. The line 42 from the single track memory chip 40 is connected to the memory line 58 through a contact 30, the memory line 58 is connected to a control computer 28, and both the read-out actuation to a memory chip 40 and write-in actuation are attained by this.

[0020] In order for a control computer 28 to make it possible to identify specific exchangeable components, it is desirable to assign each block of a serial number beforehand for every type of exchangeable components components. The suitable data which enable identification of the specific exchangeable component only by reading the serial number memorized by the memory chip 40 attached in specific exchangeable components are beforehand loaded to a control computer 28.

[0021] A control computer 28 is started periodically, makes the output from sensor A-N record at the time of actuation of a printer, and enables it to adjust a system to it using this detection data. At this time, the data from two or more memory chips are correlation

attachment \*\*\*\* so that more exact adjustment can be performed compared with the former. For example, as mentioned above, the fixing assembly had determined the amount of the silicone oil applied to a medium sheet according to the type of the medium sheet supplied. In the conventional system, in order to change the spreading rate of silicone oil, the photosensor was used and the reflection factor of a medium sheet was detected. In order to enlarge coverage of silicone oil on the medium sheet of the type chosen since silicone oil had infiltrated the sponge-like medium, the roller of a fixing assembly is slowed down. Now, when established to the transparent paper for overhead projectors, by EP printer, a roller rate is reduced about 50%. Thus, the coverage of silicone oil doubles [ about ] by reducing a rate. using this invention — moreover, based on the detailed knowledge about the busy condition of the past of the silicone oil obtained from the data memorized by the memory chip 40, without slowing down a roller, by raising the temperature of a fixing roller, the emission rate of silicone oil can be gathered and desired saturation can be obtained. Therefore, it becomes possible by getting to know the use history of past silicone oil correctly to change the temperature of a fixing roller with a control computer 28, and to make it operate at full speed by the condition that a fixing system is applied to silicone oil at an elevated temperature.

[0022] Similarly, the data which enable more exact control according to the parameter of a development module are memorizable to a memory chip 40. Now, the information which a control computer 28 memorizes about a color development module is restricted to the offset value, the page counted value, and the humidity value of a sensor. A sensor offset value is used for control of a toner-carrier ratio. It is used for page counted value also changing a toner pair carrier ratio, and compensating aging of the mechanical assembly of a development counter, and aging of the carrier itself. A carrier is a magnetic material used for conveyance of a toner, and helps generating of the suitable electrostatic charge on a toner particle.

[0023] A memory chip 40 memorizes suitably the data of the addition about the development module parameter which affects generation of an image. There are granularity of the front face of the reinforcement of the magnet of a development counter, the sleeve of a development counter and the absolute distance of a photoconductor drum, and a development counter, a magnetic absolute include angle, etc. in these data. The parameter mentioned above influences directly [ each ] in the quality of development, and a control computer 28 can compensate a precision for the fluctuation more by judging the above-mentioned parameter memorized. Similarly, the memory chip 40 which accompanies a drum records the photoelectric sensitivity (namely, charge-and-discharge property) of the drum. A control computer 28 compensates fluctuation of this parameter by adjusting a bias setup of the both sides of a toner-carrier ratio, a laser output, and a development module and a drum photo conductor.

[0024] Furthermore, the carrier particle used with a toner has the charge-to-mass ratio this carrier indicates the capacity which supplies a charge to be to a toner. This

charge-to-mass ratio is recorded after manufacture, and if charge-to-mass ratio is low, this has the weak control to a toner, and it means that a toner tends to adhere on a drum. This charge-to-mass ratio measured by the manufacturer is memorizable to the memory chip 40 attached in each development module. If initialization is performed, a printer will compensate the charge antimere quantitative ratio which separated from much setup in the printer from the range expected by adjusting (for example, a change of modification of a toner-carrier ratio, modification of a bias setup of a drum, a setup of a laser output, or a development counter bias setup etc. is made.).

[0025] If reception and required count are performed for the newest sensor data, a control computer will write new busy condition data and/or calibration data in each memory chip 40, and will update those memory conditions. Therefore, if a certain exchangeable components are moved from the 1st printer to the 2nd printer, it will enable the control computer 28 in the 2nd printer, this busy condition data and calibration data of exchangeable components that were newly permuted will be accessed, and that operating state will be adjusted to a precision according to it.

[0026] As shown in [ink jet printer] drawing 4 and drawing 5, the ink jet print cartridge 60 has the internal ink reservoir 62 which holds ink. A receptacle 66 can receive ink from a cartridge 60 with the liquid communicating tube 64. Moreover, diaphram 68 is opened for free passage by the actuator in a receptacle 66 (not shown), and the ink reservoir 62 is pressurized. An electrical connection 70 connects with at least one contact 72 on the circuit board 74 (contact land). The serial memory chip 76 (drawing 5) is formed on the circuit board 74, and is covered with the protective coat 78. I/O of the data through a single access line is possible for a memory chip 76. These engage with other key devices of a receptacle 66, an ink cartridge 60 has the key device 80, an ink cartridge 60 is the thing of a proper ink color, and it holds the ink which suits the printer system, and only when positioned by the proper sense, it enables it to insert an ink cartridge 60. The receptacle 66 is \*\*\*\*(ed) on the ink jet pen 82 through a conduit 84. The ink jet pen 82 and the receptacle 66 are electrically connected to the microprocessor 86 by which all control actuation of this ink jet printer.

[0027] As everyone knows, actuation of the ink jet pen 82 is controlled by the microprocessor 86 according to various parameters obtained from a printer driver. this parameter — a default ink injection frequency (namely, high quality mode —) Manuscript mode, the parameter which determines the pulse width of the signal impressed to each heating resistor, The parameter for controlling the amount of the preheat current to the print head for optimizing and stabilizing the temperature of the print head at the time of printing actuation, The parameter, the parameter for service stations which specify the number of the ink droplets injected by per pixel, There is a parameter which enables the judgment of print mode data (namely, parameter which makes the printing quality specified as the printer and a printing condition attain), the amount of use ink, and an ink residue.

[0028] This as which a pulse width parameter determines the ignition energy of a thermal

ink jet resistor is because applied voltage is usually fixed. The parameter which controls preheat current enables control of substrate temperature, therefore the amount of an ink droplet. By modulating this preheat current, fluctuation of the amount of ink droplets which produces dispersion in printing quality can be prevented. A printing modal parameter controls the configuration of a dot array.

[0029] In addition to a printer driver, a part of parameter mentioned above and procedure [ at least ] are memorized by the memory chip 76. Whenever a print job is started, a microprocessor 86 investigates the contents of the memory chip 76, and the parameter memorized by the printer driver according to this accessed data is changed. Then, according to this parameter, actuation of an ink jet printer is attained in a known mode.

[0030] An ink cartridge 60 has the important description of this invention in the point are most frequently exchanged in an ink jet printer and that it is a unit. Therefore, when modification of a parameter or correction of an algorithm is needed as a result of the design change to a printer, the parameter corrected after manufacture of an ink cartridge 60 can be put into a memory chip 76. If a user purchases a cartridge 60 and puts into an ink jet printer after that, actuation of the ink jet printer can be updated without all the changed parameters becoming available by the microprocessor 86 automatically, and distributing the corrected printer driver by the special approach. Consequently, an ink jet printer [ finishing / all installation ] is updated by the set of the newest parameter in a short period of time, and an algorithm only by purchasing the ink jet cartridge 60 for exchange.

[0031] There are the information and others of the serial number of the parameter of the real counted value of the ink droplet emitted from a cartridge, the date code of ink ON \*\*, the insertion date code of the beginning of an ink cartridge, a system coefficient, the type/color of ink, the size of a cartridge, a print mode, temperature data, and a heating resistor, the manufacture number of a cartridge in after years, the ink droplet counted value of a print head, a pumping algorithm, and a printer and the busy condition of a cartridge in the parameter data memorized by the memory chip 76.

[0032] A microprocessor 86 can perform many control functions in an ink jet printer with these data. For example, a microprocessor 86 calculates the estimate of the ink residue in a cartridge 60, and compares this rough value with the supply threshold recorded beforehand. When ink is less than 25% of full capacity, the message which tells a user about this is shown. Furthermore, if most part of 25% of this remaining ink is consumed, a microprocessor 86 can consider an ink jet printer as a halt of operation (a user being able to make this halt an invalid further again), and will record nullification concerning coincidence on a memory chip 76.

[0033] With the data memorized by the memory chip 76, a microprocessor 86 can judge whether a still more suitable type and the ink of a color are installed, can emit the alarm about a possible shelf life piece to a user, and can emit the alarm to use of the ink to a user further. By coding ink ON \*\*\*\*\* in this memory, a printer can judge the stage when that ink ON \*\* turns into an ink piece. Therefore, a printer is not carrying out

continuous activation of the actuation, and when proper, it can try the judgment of an ink piece.

[0034] If the detection function of the ink piece before initiation of a print job, the warning function of the amount of low ink, and a printer feedback function are explained, a printer will read the size of ink ON \*\* out of a parameter of an ink cartridge. A printer compares this read parameter with the rough value of the amount of consumption ink. (A certain specific color) When a cartridge is used first, a printer must assume a value conservative (large) about the amount of an ink droplet. Then, if it judges that a printer/computer has low ink level, ink will be injected to SUPITUN and a temperature rise will be detected from a temperature detection resistor (TSR). This temperature has the inclination to go up more rapidly, when ink ON \*\* becomes empty. If ink ON \*\* actually becomes empty, a printer will recalculate the amount of ink droplets using this information. Thus, a printer "is learned" and comes to count an ink droplet to accuracy more. There is a method of taking the midpoint of this calculated value and an early conservative ink optimum dose value as conservative operation of this information. The value used for the count of an ink droplet approaches the calculated value of all ink ON \*\* used as time amount passes. Furthermore, the rough value of the early conservative ink optimum dose programmed by memory can be updated as the amount of ink droplets comes to be controlled and grasped more by fitness.

[0035] If a printer serial number and busy condition information are explained, a printer can update the data which record the type (an average printing consistency, others) of a busy condition. A manufacturer can collect the marketing information about the use mode of a printer from the e-mail in program of a used cartridge. From this information, the parameter on a chip can be optimized further. The method of memorizing the information about an average printing consistency and the amount of consumption ink of each printing page is in one of the approaches which memorizes the busy condition information on a printer. Other amounts, such as a rate of a graphic form and a text, are also memorizable. Next, when the life piece of ink ON \*\* approaches, a printer driver compresses this information and memorizes it as a series of figures on a cartridge.

[0036] A precise approach can be acquired rather than it corrects a dot locational error, so that the information about production of an ink jet pen will increase, if storage of the dot positioning correction algorithm on a cartridge is explained. For example, dispersion arises in positioning of a dot by dispersion in the trajectory from a nozzle in a scanning direction. This dispersion is known as a SAD (Scan Axis Directionality, scan shaft-orientations attachment) error. This dispersion can be compensated by changing the injection timing (it being one of the parameters on a cartridge) of a nozzle. Failure by fatigue may arise on the ink pump which operates a cartridge. Therefore, this failure can be predicted by recording the speed of reciprocation of a pump on a cartridge. If a pump becomes the excess of use, a pumping will be reduced or stopped in order to prevent \*\*\*\*\* of ink. Therefore, the maximum throughput (a part for ml/) can be made small, and reduction of a pumping or adjustment of a halt can be performed. Furthermore, since

a pump life may also be improved with improvement in a manufacturing technology, the rough value of the pump life recorded on a cartridge can be updated.

[0037] Since the amount of ink droplets per impulse of a heating resistor can be judged with the algorithm depending on a system parameter, it can optimize count of the amount of ink droplets with the corrected parameter. Since this parameter can be continuously updated over the whole life of a printer, when a new ink cartridge is installed, it can acquire the optimal printing quality. Furthermore, pulse width, pulse heating energy, and dispersion and others of the number of ink droplets per pixel can be altogether changed and controlled according to the improvement of a system.

[0038] The logic diagram shown in drawing 6 shows an interaction with the data memorized by the ink jet printer and the memory chip 76. At a power up or the time of initiation of a print job (decision 100), a system parameter is read from the memory chip 76 of an ink cartridge (102). These parameters are used for renewal of the default parameter of a printer driver (104), and a printer controls printing quality after that using pulse width, pulse heating energy, a default injection frequency, and default ink droplet counted value (106).

[0039] Along with advance of printing, a microprocessor 86 estimates the amount of the ink used using the amount multiplier of ink droplets, ink droplet counted value, and a thermometry value. The amount of the ink used in a memory chip 76 is updated periodically (108), and a warning message is shown to a user when it turns out that ink ON \*\* became [ too little ] (decision 110). Or a print job is stopped after that (112). (this may be cancelled by the user) Completion of a print job writes the parameter corrected in preparation for actuation next to an ink jet printer in a memory chip 76 (116). (decision 114)

[0040] The procedure related to the ink busy condition parameter obtained from an ink cartridge used for this printer at drawing 7 is further shown in a detail.

[0041] As mentioned above, although the example of this invention was explained in full detail, the example of each embodiment of this invention is shown hereafter.

[0042] [Embodiment 1] It is an exchangeable ink cartridge (60) and is an exchangeable ink cartridge (60) for the ink jet print heads (82) of an ink jet printer including a processor means (86) to control an ink jet printer. Said ink jet printer contains the receptacle (66) which receives said ink cartridge (60). Said receptacle (66) is characterized by said ink cartridge (60) containing (a) thru/or (d) below including the 1st connector means (70) combined with said processor means (86).

(a) The ink reservoir holding ink (62).

(b) The 2nd connector means which will engage with said 1st connector means (70) if said ink cartridge (60) is inserted in said receptacle (66) (76).

(c) A \*\*\* means to connect said ink reservoir (62) to said ink jet print head (82) if said ink cartridge (60) is inserted in said receptacle (66) (64 84).

(d) It connects with said 2nd connector means (76), and has one data input output line (42), and it is the serial access memory (40) which becomes accessible for said

processor means (86) by this, and the serial access memory (40) which memorizes the data in which the busy condition of the ink in said ink reservoir (62) is shown at least is included.

[0043] [Embodiment 2] It is the exchangeable ink cartridge characterized by being an exchangeable ink cartridge (60) given in an embodiment 1, and said serial access memory (40) containing the parameter data by which it was corrected for said ink jet printer (60).

[0044] [Embodiment 3] When it is an exchangeable ink cartridge (60) given in an embodiment 2 and said corrected parameter data are accessed by said processor means (86), said processor means (86) is an exchangeable ink cartridge characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said corrected parameter data and other data (60).

[0045] [Embodiment 4] It is an exchangeable ink cartridge (60) given in an embodiment 1. Said serial access memory (40) memorizes the serial number showing said ink cartridge (60). Said processor means (86) has memorized data, and reads said serial number read from said serial access memory (40). The ink cartridge characterized by attaining identification of said ink cartridge (60) by comparing it with said memorized data (60).

[0046] [Embodiment 5] It is the ink cartridge characterized by being an exchangeable ink cartridge (60) given in an embodiment 1, and said serial access memory (40) being connected to said 2nd connector means (76) by only the single electric wire (60).

[0047] [Embodiment 6] It is an ink jet printer and is characterized by including (a) thru/or (d) below.

(a) A processor means to control said ink jet printer (86).

(b) Ink jet print head (82).

(c) A receptacle including the 1st connector means (70) which is a receptacle (66), received the ink cartridge (60) which can be thrown away, and was combined with said ink jet print head (82) by liquid through and said processor means (86) (66).

(d) It is the ink cartridge (60) which can be thrown away. Said receptacle (ink reservoir (62 which has the configuration which engages with 66) and holds ink), The 2nd connector means which will engage with said 1st connector means (70) if said ink cartridge (60) is inserted in said receptacle (66) (76), A \*\*\* means to connect said ink reservoir (62) to the \*\*\* means (84) in said receptacle (66) (64), And are serial access memory (40), and connect with said 2nd connector means (76), and it has one data input output line (40). The ink cartridge containing the serial access memory (40) which memorizes the data in which it is accessible and the busy condition of the ink in said ink reservoir (62) is shown at least for said processor means (86) which can be thrown away (60).

[0048] [Embodiment 7] It is the ink jet printer characterized by being an ink jet printer given in an embodiment 6, and said serial access memory (40) containing the parameter data by which it was corrected for said ink jet printer.

[0049] [Embodiment 8] When it is an ink jet printer given in an embodiment 7 and said corrected parameter data are accessed by said processor means (86), said processor

means (86) is an ink jet printer characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said corrected parameter data and other data.

[0050] [Embodiment 9] It is an ink jet printer given in an embodiment 6. Said serial access memory (40) memorizes the serial number showing said ink cartridge (60). Said processor means (86) has memorized data, and reads said serial number read from said serial access memory (40). The ink jet printer characterized by attaining identification of said ink cartridge (60) by comparing it with said memorized data.

[0051] [Embodiment 10] It is the approach of an ink jet printer of operation. Said printer Processor means (86), The receptacle (66) combined with the ink jet print head (82) and said ink jet print head (82) which receives the ink cartridge (60) which can be thrown away is included. Said receptacle (66) is characterized by said approach of operation containing the step of (a) thru/or (c) below including the 1st connector means (70) further combined with said processor means (86).

(a) It is the step which inserts the ink cartridge (60) which can be thrown away to said receptacle (66). Said cartridge (ink reservoir (62 to which 60) holds ink). The 2nd connector means which engages with said 1st connector means (70) (76), A \*\*\*\* means to connect said ink reservoir (62) to the \*\*\*\* means (84) in said receptacle (66) (64). And it is serial access memory (40), and when it connects with said 2nd connector means (76) and said cartridge (60) is inserted in said receptacle (66), the serial access memory (40) which becomes accessible for said processor means (86) is included.

(b) It is the step of said PUROSSESA means in the time of initiation of a print job of operation. [ whether from the data memorized by said memory (40), the cartridge (60) exists possible / actuation / in said (i) receptacle (66), and ] (ii) Step which updates the corresponding parameter value which judges the parameter value for controlling discernment of said cartridge (60), and (iii) said printer, and already exists in said printer using said parameter value.

(c) The step which is a step of said PUROSSESA means in the time of completion of said print job of operation, and is updated by writing in the adjusted value which enables the judgment of the ink residue in said ink reservoir (62) for the data memorized by said memory (40).

[0052] [Embodiment 11] It is the approach characterized by being the approach of a publication and writing the correction parameter to said serial access memory (40) in an embodiment 10 according to the data with which said processor means (86) was acquired in the step (c) in other locations in said printer.

[0053] [Embodiment 12] It is an exchangeable ink cartridge (60). It is an exchangeable ink cartridge (60) for the ink jet print heads (82) of an ink jet printer including a processor means (86) to control an ink jet printer. Said ink jet printer contains the receptacle (66) which receives said ink cartridge (60). Said receptacle (66) is characterized by including the following (a) thru/or (d) by said ink cartridge (60) at an ink jet print head (82) including liquid through and the 1st connector means (70) further combined with said

processor means (86).

(a) The ink reservoir holding ink (62).

(b) The 2nd connector means which will engage with said 1st connector means (70) if said ink cartridge (60) is inserted in said receptacle (66) (76).

(c) A \*\*\* means to connect said ink reservoir (62) to said ink jet print head (82) if said ink cartridge (60) is inserted in said receptacle (66) (64).

(d) A serial access memory chip means to memorize the data in which it is a serial access memory chip means (40), connects with said 2nd connector means (76), and becomes accessible for said processor means (86) by it, and the busy condition of the ink in said ink reservoir (62) is shown, and the data in which the parameter for controlling actuation of said ink jet print head (82) further is shown (40).

[0054] [Embodiment 13] When it is an exchangeable ink cartridge (60) given in an embodiment 12 and said parameter data for controlling actuation of said ink jet print head (82) are accessed by said processor means (86), said processor means (86) is an ink cartridge characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said parameter and other data (60).

[0055] [Embodiment 14] It is an ink jet printer and is characterized by including (a) thru/or (d) below.

(a) A processor means to control said ink jet printer (86).

(b) Ink jet print head (82).

(c) The receptacle which is a receptacle (66) which receives the ink cartridge (60) which can be thrown away, and includes the 1st connector means (70) combined with said ink jet print head (82) by liquid through and said processor means (86) (66).

(d) Are the ink cartridge (60) which can be thrown away and it has the configuration which engages with said receptacle (66). The 2nd connector means which will engage with said 1st connector means (70) if ink reservoir (62) holding ink and said ink cartridge (60) are inserted in said receptacle (66) (76), A \*\*\* means to connect said ink reservoir (62) to the \*\*\* means (84) in said receptacle (66) (64), And are serial access memory (40) and it connects with said 2nd connector means (76). It becomes accessible for said processor means (86) by it. The ink cartridge containing the serial access memory (40) which memorizes the data in which the busy condition of the ink in said ink reservoir (62) is shown, and the data in which the parameter for controlling actuation of said ink jet print head (82) further is shown which can be thrown away (60).

[0056] [Embodiment 15] When it is the ink jet printer of a publication and said parameter for carrying out said ink jet print head (82) control is accessed by the embodiment 14 with said processor means (86), said processor means (86) is an ink jet printer characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said parameter data and other data.

[0057] [Embodiment 16] Are equipment which prints on a medium sheet, and it suits so that the exchangeable components containing the article of consumption used at the time of actuation of the exchangeable components worn out or said equipment may be

received. To the receptacle (66) for receiving a processor means (86) to control said equipment, and exchangeable components (60), and said one receptacle (66), a relating eclipse, In equipment including the 1st connector means (70) combined with said processor means (86), said exchangeable component (60) is characterized by including the following (a) and (b).

- (a) The 2nd connector means which engages with said 1st connector means (70) (76).
- (b) Said processor means (86) is equipment characterized by the ability to perform both writing of data to said serial access memory (40), and read-out including the serial access memory (40) which memorizes the data in which it is serial access memory (40), and one data input output line (42) connects with said 2nd connector means (76), and the busy condition of said exchangeable component (60) is shown at least with it.

[0058] [Embodiment 17] It is equipment characterized by being equipment given in an embodiment 16 and controlling said serial access memory (40) to memorize the calibration data for said equipment further, and for said processor means (86) to access said calibration data, and to enable generating of the control signal for said equipment combining said calibration data and other data.

[0059] [Embodiment 18] Are equipment given in an embodiment 16 and said serial access memory (40) memorizes the serial number showing said exchangeable component (60). Said processor means (86) has memorized data, and reads said serial number read from said serial access memory (40). Equipment characterized by attaining identification of said exchangeable component (60) by comparing it with said memorized data.

[0060] [Embodiment 19] Are equipment given in an embodiment 16 and said serial access memory (40) is connected to a fixing assembly. If it judges that it has data about the use hysteresis of the past of built-in silicone oil ON \*\*, and it is going to pass said processor means (86) after the transparency medium sheet has contacted it Equipment characterized by correcting the temperature of said fixing assembly according to the data about the use hysteresis of said past.

[0061] [Embodiment 20] Said processor means (86) is equipment characterized by being equipment given in an embodiment 16, memorizing the parameter which specifies the charge-to-mass ratio of a toner carrier which said serial access memory (40) was connected to the development module, and went into said development module, correcting a setup of other means in said equipment using said parameter, and compensating said charge-to-mass ratio parameter.

[0062] [Embodiment 21] It is equipment characterized by to be equipment given in an embodiment 16, and to memorize the parameter which said serial access memory (40) is connected to a development module, and specifies the reinforcement of the magnet of a development counter, and the field of said development module and the distance between photoconductor drums, and for said processor means (86) to enable adjustment of other parameters in said equipment using said parameter, and to compensate it.

[0063] Please understand the above explanation to be what is what [ only ] illustrates this invention. Probably, a design of various alternative-like modes and the strange

gestalt will be possible, without deviating from this invention to this contractor. Therefore, this invention contains all these alternative-like modes applicable to a claim, the deformation modes, and modification modes.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] It reaches and this invention relates to the consumables and the supply components which have the unification memory for memorizing busy condition data, calibration data, and other data in a detail more about exchangeable consumables and the equipment using supply components.

#### [0002]

[Description of the Prior Art] The latest copying machine, a printer, and a plotter and others have the control microprocessor which needs the input calibration data for internal configuration elements, in order to draw up a document quality almost altogether. Although most of these equipments are constituted so that a user can exchange articles of consumption, the user (or serviceman) who performs exchange has to perform the input of busy condition data and calibration data. If an error is in the input of calibration data, the engine performance of equipment may fall greatly or may turn into impossible of operation.

[0003] About the judgment of the busy condition of consumables, the conventional technique was restricted to simple record input extent for generally telling a user about the required stage of exchange. For example, the copying machine enables the processor to maintain the display of output pagination, and internal record of the engine speed of a drum (or organic sensitization web), and to tell the required stage of service or exchange by signal in many cases.

[0004] The exchangeable development module is used for electrophotography-type a current printer and a current copying machine many. Each development module has a toner, a toner carrier, and a device for sending the mixture of a toner and a carrier to a drum (or web) side further. In order to obtain the proper control signal level for a laser exposure system, a control microprocessor adjusts the ratio of a toner and a carrier so that suitable mixture can be obtained. There is a method of preparing the oscillator circuit where the frequency changes with toner-carrier ratios as the control approach of a toner pair carrier ratio. In it, sufficient data which can judge a toner-carrier ratio from this oscillator circuit are stored, covering it for many minutes at the time of attachment of a new development module, and it enables it to set up proper signal level in a laser exposure system at it. If a development module is picked out from equipment or is moved to other equipments, this whole calibration procedure must be repeated and performed.

[0005] Although the printer and the copying machine had counted output pagination conventionally as mentioned above, the difference of whenever [ exhausting / which is

produced by the difference in a medium type ] is not reflected in the starting simple page counted value. For example, if about 80,000 pages are printed by the standard medium type for a fixing (platen roller of pair with which the one side or both are heated is included) assembly, a surface breakdown device phenomenon will arise. Dispersion arises in consumption of a fixing assembly and this dispersion is not reflected in simple page counted value by difference of a medium type.

[0006] Saturation is raised to the fixing assembly used for a color printer, and the silicone oil for giving gloss to the medium after printing is used. The amount of the oil applied must be changed with a medium type. The control system for judging the amount of the oil which a fixing assembly should get to know a medium type, and should apply is formed. Although a processor records the amount of accumulation used of oil, when a fixing assembly is removed or the stored data about an oil busy condition is lost, in case a fixing assembly is used again, there is no approach of reconstructing this busy condition.

[0007] Similarly, an electrophotography type drum has the sensitization layer which shows predetermined charge sensibility. The data of this charge sensibility are used as a control parameter of the power control loop of a laser exposure system. Conventionally, these charge sensibility data were inputted by the operator. However, if a drum is moved between printers so that it may see at the time of service, these data cannot be moved with a drum but must be reinputted.

[0008] The print head of throwing away which has unified ink ON \*\* is used for an ink jet printer. In the disposable printing assembly indicated in the U.S. Pat. No. 5,049,898 number of Arthur transferred to the same grantee as this application, and others, the data which describe the description of the assembly to a unification memory element are memorized. Arthur and others offered the ink jet print head assembly which has the memory which specifies the location of the color of the ink in a print head, its amount, and the ink jet orifice plate on a print head body. These data are read from a print head with read-out / write-in element in a printer, and are used or displayed if needed.

[0009] Many parameters (from the installed printer driver) for operating a print head with high dependability, and enabling continuous generation of the print job of high quality are used for an ink jet printer. A heating resistor is used for each of an ink jet orifice which injects one or the ink droplet beyond it by energizing in a thermal ink jet print head as everyone knows. In order to obtain the amount of a desired ink droplet, the amount of currents impressed to a heating resistor is decided by combination of some factors, and this is as a result of [ of a certain algorithm ] count. The amount of an ink droplet is decided by the structure and others of detection temperature, the constant reflecting the property of ink, and an ink orifice. This parameter is supplied to a power up from a printer driver at an ink jet printer.

[0010] When judging that correction is required in the parameter which requires a manufacturer, a manufacturer has to publish the updating version of a printer driver, and he has to take a measure so that this may be supplied to both the past purchaser and a new purchaser. Furthermore, when changing while manufacturing the design of a print

head, modification of a parameter is needed for this modification in many cases. Also in this case, a new printer driver is needed.

[0011]

[Problem(s) to be Solved by the Invention] It unites with it and many of substitute parts [exhausting] for a printer or copying machines have the fuse in which it is shown whether the substitute part is a new article or it is a used thing. If a control microprocessor judges with the fuse not flying at the time of insertion of a substitute part, a machine will judge that the substitute part is a new article, and will make zero counted value which shows the estimated usable period of the component. It indicates that the data applied to a user on a control panel are required for a microprocessor when input data is still more nearly required about a substitute part, or (like [the toner pair carrier ratio in a development module / of a case]) the data are automatically collected from a substitute part sensor. Then, a fuse is flown.

[0012] The circuit by the conventional technique which starts for electro-photographic printers is shown in drawing 1. In this circuit, plug connection of each of two or more consumption components is made with an interface 10 at the printer. There are the oil pad module 12, (Black K) toner development module 14, the color development module 16, the fixing assembly 18, the imprint assembly 20, and photograph drum assembly 22 grade in this article of consumption by which plug connection is made. It will be understood by this contractor that there are consumables in which the plug connection with a printer other than above-mentioned consumables is possible. Each consumables have the fuse 24 melted with the fuse fusing circuit module 26, when the proofreading actuation by the control computer 28 is completed. A fuse 24 is built into each structure of a substitute part, and is connected to the contact 30 of the multiple contact connector which interfaces with the connector in a printer through one electric wire. The circuit which passes a fuse 24 by the ground connection 32 in a substitute part is completed.

[0013] The purpose of this invention is offering the exchangeable components / consumables which has the unification memory in which storage and modification of both busy condition data and calibration data are possible.

[0014] Other purposes of this invention are offering the exchangeable components / consumables which has the memory module which does not need modification to the existing physical interface between the component and the equipment which attaches it.

[0015]

[Means for Solving the Problem] Ink jet printing / reproducing unit holds the exchange ink cartridge used for printing/copy actuation. This equipment has the receptacle which has the 1st connector combined with the processor which controls actuation of the equipment. A cartridge has the 2nd connector and this connector engages with the memory connected to the 1st connector and this 2nd connector. Both the data transfer from this memory and the data transfer to this memory are possible, and access and modification to the data showing the parameter for controlling the busy condition of a cartridge, proofreading, and actuation of equipment memorized by this at memory are possible. The direct permutation

of memory is possible instead of the fuse prepared by use of the serial access memory on a cartridge now, without adding modification to the physical interface between the cartridge-connectors which enable engagement to the equipment of a cartridge and a cartridge by this although the I/O on one electric wire is possible.

[0016]

[Example] Although this invention is explained with reference to an electro-photographic printer and an ink jet printer below, this invention is applicable to the equipment with which computer control of the arbitration which has exchangeable components / consumables was carried out.

[0017] This invention enables storage of the busy condition data to the single track memory module by which internal organs are carried out to exchangeable components, and calibration data. Therefore, when exchangeable components are moved from the 1st equipment to the 2nd equipment, according to the data memorized by the onboard memory of this component in the 2nd equipment, adjustment of that control parameter is possible. This is important especially when the data from exchangeable components must be made to correlate with other data, in order to generate a device control signal. For example, if the humidity data detected within a printer are combined with the sensibility data of a photo conductor, they will affect an exposure setup of laser directly. If mistaken photo conductor sensibility data are used, a bad influence will appear in the engine performance of a printer.

[0018] Recently, single track I/O serial memory is marketed increasingly. As this kind of memory, there is DS1992-DS1995 Touch Memory series of Dallas Semi-Conductors Inc. Such memory is constituted as non-volatile random access memory which has the storage capacity of 1K to 16 K bytes, respectively. In the case of DS1992, 128 bytes of internal nonvolatile RAM is constituted as a scratch pad which are four storage regions which are 32 bytes each, and 32 bytes. I/O of the data from this single track memory is performed by the protocol using the pulse of various die length showing the beginning of read-out / write-in actuation. A transfer of bit wise is performed after these pulses and 1 and 0 are expressed with different pulse duration in this transfer. Serial input/output memory other than this can also be used for this invention.

[0019] As shown in [electro-photographic printer] drawing 2, each exchangeable components / consumables engage with the receptacle 36 (shown briefly) in a printer 38. The fuse shown in drawing 1 is transposed to the memory chip 40, respectively, it connects with the existing connector 30 through an electric wire 42, and this memory chip can memorize both the busy condition data about exchangeable components, and calibration data. The interface of the exchangeable components 50 within a printer and a connector 52 is further shown in a detail at drawing 3. The exchangeable components 50 have two or more sensor A-N which interconnected with the interface board 54 by which the single track memory chip 40 and the electronic-parts module 56 were attached. (not shown [ the great portion of interconnect on a board 54 ] in order to simplify a drawing) Sensor A-N supplies a signal to the electronic-parts module 56, and this module gives an interface

function to a connector 52, connected various control lines, and a detection line. The line 42 from the single track memory chip 40 is connected to the memory line 58 through a contact 30, the memory line 58 is connected to a control computer 28, and both the read-out actuation to a memory chip 40 and write-in actuation are attained by this.

[0020] In order for a control computer 28 to make it possible to identify specific exchangeable components, it is desirable to assign each block of a serial number beforehand for every type of exchangeable components components. The suitable data which enable identification of the specific exchangeable component only by reading the serial number memorized by the memory chip 40 attached in specific exchangeable components are beforehand loaded to a control computer 28.

[0021] A control computer 28 is started periodically, makes the output from sensor A-N record at the time of actuation of a printer, and enables it to adjust a system to it using this detection data. At this time, the data from two or more memory chips are correlation attachment \*\*\*\* so that more exact adjustment can be performed compared with the former. For example, as mentioned above, the fixing assembly had determined the amount of the silicone oil applied to a medium sheet according to the type of the medium sheet supplied. In the conventional system, in order to change the spreading rate of silicone oil, the photosensor was used and the reflection factor of a medium sheet was detected. In order to enlarge coverage of silicone oil on the medium sheet of the type chosen since silicone oil had infiltrated the sponge-like medium, the roller of a fixing assembly is slowed down. Now, when established to the transparent paper for overhead projectors, by EP printer, a roller rate is reduced about 50%. Thus, the coverage of silicone oil doubles [ about ] by reducing a rate. using this invention .. moreover, based on the detailed knowledge about the busy condition of the past of the silicone oil obtained from the data memorized by the memory chip 40, without slowing down a roller, by raising the temperature of a fixing roller, the emission rate of silicone oil can be gathered and desired saturation can be obtained. Therefore, it becomes possible by getting to know the use history of past silicone oil correctly to change the temperature of a fixing roller with a control computer 28, and to make it operate at full speed by the condition that a fixing system is applied to silicone oil at an elevated temperature.

[0022] Similarly, the data which enable more exact control according to the parameter of a development module are memorizable to a memory chip 40. Now, the information which a control computer 28 memorizes about a color development module is restricted to the offset value, the page counted value, and the humidity value of a sensor. A sensor offset value is used for control of a toner-carrier ratio. It is used for page counted value also changing a toner pair carrier ratio, and compensating aging of the mechanical assembly of a development counter, and aging of the carrier itself. A carrier is a magnetic material used for conveyance of a toner, and helps generating of the suitable electrostatic charge on a toner particle.

[0023] A memory chip 40 memorizes suitably the data of the addition about the development module parameter which affects generation of an image. There are

granularity of the front face of the reinforcement of the magnet of a development counter, the sleeve of a development counter and the absolute distance of a photoconductor drum, and a development counter, a magnetic absolute include angle, etc. in these data. The parameter mentioned above influences directly [ each ] in the quality of development, and a control computer 28 can compensate a precision for the fluctuation more by judging the above-mentioned parameter memorized. Similarly, the memory chip 40 which accompanies a drum records the photoelectric sensitivity (namely, charge-and-discharge property) of the drum. A control computer 28 compensates fluctuation of this parameter by adjusting a bias setup of the both sides of a toner-carrier ratio, a laser output, and a development module and a drum photo conductor.

[0024] Furthermore, the carrier particle used with a toner has the charge-to-mass ratio this carrier indicates the capacity which supplies a charge to be to a toner. This charge-to-mass ratio is recorded after manufacture, and if charge-to-mass ratio is low, this has the weak control to a toner, and it means that a toner tends to adhere on a drum. This charge-to-mass ratio measured by the manufacturer is memorizable to the memory chip 40 attached in each development module. If initialization is performed, a printer will compensate the charge antimere quantitative ratio which separated from much setup in the printer from the range expected by adjusting (for example, a change of modification of a toner-carrier ratio, modification of a bias setup of a drum, a setup of a laser output, or a development counter bias setup etc. is made.).

[0025] If reception and required count are performed for the newest sensor data, a control computer will write new busy condition data and/or calibration data in each memory chip 40, and will update those memory conditions. Therefore, if a certain exchangeable components are moved from the 1st printer to the 2nd printer, this busy condition data and calibration data of exchangeable components that were newly permuted will be accessed, and that operating state will be adjusted to a precision according to it.

[0026] As shown in [ink jet printer] drawing 4 and drawing 5, the ink jet print cartridge 60 has the internal ink reservoir 62 which holds ink. A receptacle 66 can receive ink from a cartridge 60 with the liquid communicating tube 64. Moreover, diaphragm 68 is opened for free passage by the actuator in a receptacle 66 (not shown), and the ink reservoir 62 is pressurized. An electrical connection 70 connects with at least one contact 72 on the circuit board 74 (contact land). The serial memory chip 76 (drawing 5) is formed on the circuit board 74, and is covered with the protective coat 78. I/O of the data through a single access line is possible for a memory chip 76. These engage with other key devices of a receptacle 66, an ink cartridge 60 has the key device 80, an ink cartridge 60 is the thing of a proper ink color, and it holds the ink which suits the printer system, and only when positioned by the proper sense, it enables it to insert an ink cartridge 60. The receptacle 66 is \*\*\*\*(ed) on the ink jet pen 82 through a conduit 84. The ink jet pen 82 and the receptacle 66 are electrically connected to the microprocessor 86 by which all control actuation of this ink jet printer.

[0027] As everyone knows, actuation of the ink jet pen 82 is controlled by the microprocessor 86 according to various parameters obtained from a printer driver. this parameter .. a default ink injection frequency (namely, high quality mode ..) Manuscript mode, the parameter which determines the pulse width of the signal impressed to each heating resistor, The parameter for controlling the amount of the preheat current to the print head for optimizing and stabilizing the temperature of the print head at the time of printing actuation, The parameter, the parameter for service stations which specify the number of the ink droplets injected by per pixel, There is a parameter which enables the judgment of print mode data (namely, parameter which makes the printing quality specified as the printer and a printing condition attain), the amount of use ink, and an ink residue.

[0028] This as which a pulse width parameter determines the ignition energy of a thermal ink jet resistor is because applied voltage is usually fixed. The parameter which controls preheat current enables control of substrate temperature, therefore the amount of an ink droplet. By modulating this preheat current, fluctuation of the amount of ink droplets which produces dispersion in printing quality can be prevented. A printing modal parameter controls the configuration of a dot array.

[0029] In addition to a printer driver, a part of parameter mentioned above and procedure [ at least ] are memorized by the memory chip 76. Whenever a print job is started, a microprocessor 86 investigates the contents of the memory chip 76, and the parameter memorized by the printer driver according to this accessed data is changed. Then, according to this parameter, actuation of an ink jet printer is attained in a known mode.

[0030] An ink cartridge 60 has the important description of this invention in the point are most frequently exchanged in an ink jet printer and that it is a unit. Therefore, when modification of a parameter or correction of an algorithm is needed as a result of the design change to a printer, the parameter corrected after manufacture of an ink cartridge 60 can be put into a memory chip 76. If a user purchases a cartridge 60 and puts into an ink jet printer after that, actuation of the ink jet printer can be updated without all the changed parameters becoming available by the microprocessor 86 automatically, and distributing the corrected printer driver by the special approach. Consequently, an ink jet printer [ finishing / all installation ] is updated by the set of the newest parameter in a short period of time, and an algorithm only by purchasing the ink jet cartridge 60 for exchange.

[0031] There are the information and others of the serial number of the parameter of the real counted value of the ink droplet emitted from a cartridge, the date code of ink ON \*\*, the insertion date code of the beginning of an ink cartridge, a system coefficient, the type/color of ink, the size of a cartridge, a print mode, temperature data, and a heating resistor, the manufacture number of a cartridge in after years, the ink droplet counted value of a print head, a pumping algorithm, and a printer and the busy condition of a cartridge in the parameter data memorized by the memory chip 76.

[0032] A microprocessor 86 can perform many control functions in an ink jet printer with these data. For example, a microprocessor 86 calculates the estimate of the ink residue in a

cartridge 60, and compares this rough value with the supply threshold recorded beforehand. When ink is less than 25% of full capacity, the message which tells a user about this is shown. Furthermore, if most part of 25% of this remaining ink is consumed, a microprocessor 86 can consider an ink jet printer as a halt of operation (a user being able to make this halt an invalid further again), and will record nullification concerning coincidence on a memory chip 76.

[0033] With the data memorized by the memory chip 76, a microprocessor 86 can judge whether a still more suitable type and the ink of a color are installed, can emit the alarm about a possible shelf life piece to a user, and can emit the alarm to use of the ink to a user further. By coding ink ON \*\*\*\*\* in this memory, a printer can judge the stage when that ink ON \*\* turns into an ink piece. Therefore, a printer is not carrying out continuous activation of the actuation, and when proper, it can try the judgment of an ink piece.

[0034] If the detection function of the ink piece before initiation of a print job, the warning function of the amount of low ink, and a printer feedback function are explained, a printer will read the size of ink ON \*\* out of a parameter of an ink cartridge. A printer compares this read parameter with the rough value of the amount of consumption ink. (A certain specific color) When a cartridge is used first, a printer must assume a value conservative (large) about the amount of an ink droplet. Then, if it judges that a printer/computer has low ink level, ink will be injected to SUPITUN and a temperature rise will be detected from a temperature detection resistor (TSR). This temperature has the inclination to go up more rapidly, when ink ON \*\* becomes empty. If ink ON \*\* actually becomes empty, a printer will recalculate the amount of ink droplets using this information. Thus, a printer "is learned" and comes to count an ink droplet to accuracy more. There is a method of taking the midpoint of this calculated value and an early conservative ink optimum dose value as conservative operation of this information. The value used for the count of an ink droplet approaches the calculated value of all ink ON \*\* used as time amount passes. Furthermore, the rough value of the early conservative ink optimum dose programmed by memory can be updated as the amount of ink droplets comes to be controlled and grasped more by fitness.

[0035] If a printer serial number and busy condition information are explained, a printer can update the data which record the type (an average printing consistency, others) of a busy condition. A manufacturer can collect the marketing information about the use mode of a printer from the e-mail in program of a used cartridge. From this information, the parameter on a chip can be optimized further. The method of memorizing the information about an average printing consistency and the amount of consumption ink of each printing page is in one of the approaches which memorizes the busy condition information on a printer. Other amounts, such as a rate of a graphic form and a text, are also memorizable. Next, when the life piece of ink ON \*\* approaches, a printer driver compresses this information and memorizes it as a series of figures on a cartridge.

[0036] A precise approach can be acquired rather than it corrects a dot locational error, so that the information about production of an ink jet pen will increase, if storage of the dot

positioning correction algorithm on a cartridge is explained. For example, dispersion arises in positioning of a dot by dispersion in the trajectory from a nozzle in a scanning direction. This dispersion is known as a SAD (Scan Axis Directionality, scan shaft orientations attachment) error. This dispersion can be compensated by changing the injection timing (it being one of the parameters on a cartridge) of a nozzle. Failure by fatigue may arise on the ink pump which operates a cartridge. Therefore, this failure can be predicted by recording the speed of reciprocation of a pump on a cartridge. If a pump becomes the excess of use, a pumping will be reduced or stopped in order to prevent \*\*\*\*\* of ink. Therefore, the maximum throughput (a part for ml) can be made small, and reduction of a pumping or adjustment of a halt can be performed. Furthermore, since a pump life may also be improved with improvement in a manufacturing technology, the rough value of the pump life recorded on a cartridge can be updated.

[0037] Since the amount of ink droplets per impulse of a heating resistor can be judged with the algorithm depending on a system parameter, it can optimize count of the amount of ink droplets with the corrected parameter. Since this parameter can be continuously updated over the whole life of a printer, when a new ink cartridge is installed, it can acquire the optimal printing quality. Furthermore, pulse width, pulse heating energy, and dispersion and others of the number of ink droplets per pixel can be altogether changed and controlled according to the improvement of a system.

[0038] The logic diagram shown in drawing 6 shows an interaction with the data memorized by the ink jet printer and the memory chip 76. At a power up or the time of initiation of a print job (decision 100), a system parameter is read from the memory chip 76 of an ink cartridge (102). These parameters are used for renewal of the default parameter of a printer driver (104), and a printer controls printing quality after that using pulse width, pulse heating energy, a default injection frequency, and default ink droplet counted value (106).

[0039] Along with advance of printing, a microprocessor 86 estimates the amount of the ink used using the amount multiplier of ink droplets, ink droplet counted value, and a thermometry value. The amount of the ink used in a memory chip 76 is updated periodically (108), and a warning message is shown to a user when it turns out that ink ON \*\* became [ too little ] (decision 110). Or a print job is stopped after that (112). (this may be cancelled by the user) Completion of a print job writes the parameter corrected in preparation for actuation next to an ink jet printer in a memory chip 76 (116). (decision 114)

[0040] The procedure related to the ink busy condition parameter obtained from an ink cartridge used for this printer at drawing 7 is further shown in a detail.

[0041] As mentioned above, although the example of this invention was explained in full detail, the example of each embodiment of this invention is shown hereafter.

[0042] [Embodiment 1] It is an exchangeable ink cartridge (60) and is an exchangeable ink cartridge (60) for the ink jet print heads (82) of an ink jet printer including a processor means (86) to control an ink jet printer. Said ink jet printer contains the receptacle (66)

which receives said ink cartridge (60). Said receptacle (66) is characterized by said ink cartridge (60) containing (a) thru/or (d) below including the 1st connector means (70) combined with said processor means (86).

(a) The ink reservoir holding ink (62).

(b) The 2nd connector means which will engage with said 1st connector means (70) if said ink cartridge (60) is inserted in said receptacle (66) (76).

(c) A \*\*\*\* means to connect said ink reservoir (62) to said ink jet print head (82) if said ink cartridge (60) is inserted in said receptacle (66) (64 84).

(d) It connects with said 2nd connector means (76), and has one data input output line (42), and it is the serial access memory (40) which becomes accessible for said processor means (86) by this, and the serial access memory (40) which memorizes the data in which the busy condition of the ink in said ink reservoir (62) is shown at least is included.

[0043] [Embodiment 2] It is the exchangeable ink cartridge characterized by being an exchangeable ink cartridge (60) given in an embodiment 1, and said serial access memory (40) containing the parameter data by which it was corrected for said ink jet printer (60).

[0044] [Embodiment 3] When it is an exchangeable ink cartridge (60) given in an embodiment 2 and said corrected parameter data are accessed by said processor means (86), said processor means (86) is an exchangeable ink cartridge characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said corrected parameter data and other data (60).

[0045] [Embodiment 4] It is an exchangeable ink cartridge (60) given in an embodiment 1. Said serial access memory (40) memorizes the serial number showing said ink cartridge (60). Said processor means (86) has memorized data, and reads said serial number read from said serial access memory (40). The ink cartridge characterized by attaining identification of said ink cartridge (60) by comparing it with said memorized data (60).

[0046] [Embodiment 5] It is the ink cartridge characterized by being an exchangeable ink cartridge (60) given in an embodiment 1, and said serial access memory (40) being connected to said 2nd connector means (76) by only the single electric wire (60).

[0047] [Embodiment 6] It is an ink jet printer and is characterized by including (a) thru/or (d) below.

(a) A processor means to control said ink jet printer (86).

(b) Ink jet print head (82).

(c) A receptacle including the 1st connector means (70) which is a receptacle (66), received the ink cartridge (60) which can be thrown away, and was combined with said ink jet print head (82) by liquid through and said processor means (86) (66).

(d) It is the ink cartridge (60) which can be thrown away. Said receptacle (ink reservoir (62 which has the configuration which engages with 66) and holds ink), The 2nd connector means which will engage with said 1st connector means (70) if said ink cartridge (60) is inserted in said receptacle (66) (76), A \*\*\*\* means to connect said ink reservoir (62) to the \*\*\*\* means (84) in said receptacle (66) (64), And are serial access memory (40), and connect with said 2nd connector means (76), and it has one data input output line (40). The ink

cartridge containing the serial access memory (40) which memorizes the data in which it is accessible and the busy condition of the ink in said ink reservoir (62) is shown at least for said processor means (86) which can be thrown away (60).

[0048] [Embodiment 7] It is the ink jet printer characterized by being an ink jet printer given in an embodiment 6, and said serial access memory (40) containing the parameter data by which it was corrected for said ink jet printer.

[0049] [Embodiment 8] When it is an ink jet printer given in an embodiment 7 and said corrected parameter data are accessed by said processor means (86), said processor means (86) is an ink jet printer characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said corrected parameter data and other data.

[0050] [Embodiment 9] It is an ink jet printer given in an embodiment 6. Said serial access memory (40) memorizes the serial number showing said ink cartridge (60). Said processor means (86) has memorized data, and reads said serial number read from said serial access memory (40). The ink jet printer characterized by attaining identification of said ink cartridge (60) by comparing it with said memorized data.

[0051] [Embodiment 10] It is the approach of an ink jet printer of operation. Said printer Processor means (86), The receptacle (66) combined with the ink jet print head (82) and said ink jet print head (82) which receives the ink cartridge (60) which can be thrown away is included. Said receptacle (66) is characterized by said approach of operation containing the step of (a) thru/or (c) below including the 1st connector means (70) further combined with said processor means (86).

(a) It is the step which inserts the ink cartridge (60) which can be thrown away to said receptacle (66). Said cartridge (ink reservoir (62 to which 60) holds ink), The 2nd connector means which engages with said 1st connector means (70) (76), A \*\*\*\* means to connect said ink reservoir (62) to the \*\*\*\* means (84) in said receptacle (66) (64), And it is serial access memory (40), and when it connects with said 2nd connector means (76) and said cartridge (60) is inserted in said receptacle (66), the serial access memory (40) which becomes accessible for said processor means (86) is included.

(b) It is the step of said PUROSSESA means in the time of initiation of a print job of operation. [ whether from the data memorized by said memory (40), the cartridge (60) exists possible / actuation / in said (i) receptacle (66), and ] (ii) Step which updates the corresponding parameter value which judges the parameter value for controlling discernment of said cartridge (60), and (iii) said printer, and already exists in said printer using said parameter value.

(c) The step which is a step of said PUROSSESA means in the time of completion of said print job of operation, and is updated by writing in the adjusted value which enables the judgment of the ink residue in said ink reservoir (62) for the data memorized by said memory (40).

[0052] [Embodiment 11] It is the approach characterized by being the approach of a publication and writing the correction parameter to said serial access memory (40) in an

embodiment 10 according to the data with which said processor means (86) was acquired in the step (c) in other locations in said printer.

[0053] [Embodiment 12] It is an exchangeable ink cartridge (60). It is an exchangeable ink cartridge (60) for the ink jet print heads (82) of an ink jet printer including a processor means (86) to control an ink jet printer. Said ink jet printer contains the receptacle (66) which receives said ink cartridge (60). Said receptacle (66) is characterized by including the following (a) thru/or (d) by said ink cartridge (60) at an ink jet print head (82) including liquid through and the 1st connector means (70) further combined with said processor means (86).

(a) The ink reservoir holding ink (62).

(b) The 2nd connector means which will engage with said 1st connector means (70) if said ink cartridge (60) is inserted in said receptacle (66) (76).

(c) A \*\*\*\* means to connect said ink reservoir (62) to said ink jet print head (82) if said ink cartridge (60) is inserted in said receptacle (66) (64).

(d) A serial access memory chip means to memorize the data in which it is a serial access memory chip means (40), connects with said 2nd connector means (76), and becomes accessible for said processor means (86) by it, and the busy condition of the ink in said ink reservoir (62) is shown, and the data in which the parameter for controlling actuation of said ink jet print head (82) further is shown (40).

[0054] [Embodiment 13] When it is an exchangeable ink cartridge (60) given in an embodiment 12 and said parameter data for controlling actuation of said ink jet print head (82) are accessed by said processor means (86), said processor means (86) is an ink cartridge characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said parameter and other data (60).

[0055] [Embodiment 14] It is an ink jet printer and is characterized by including (a) thru/or (d) below.

(a) A processor means to control said ink jet printer (86).

(b) Ink jet print head (82).

(c) The receptacle which is a receptacle (66) which receives the ink cartridge (60) which can be thrown away, and includes the 1st connector means (70) combined with said ink jet print head (82) by liquid through and said processor means (86) (66).

(d) Are the ink cartridge (60) which can be thrown away and it has the configuration which engages with said receptacle (66). The 2nd connector means which will engage with said 1st connector means (70) if ink reservoir (62) holding ink and said ink cartridge (60) are inserted in said receptacle (66) (76), A \*\*\*\* means to connect said ink reservoir (62) to the \*\*\*\* means (84) in said receptacle (66) (64), And are serial access memory (40) and it connects with said 2nd connector means (76). It becomes accessible for said processor means (86) by it. The ink cartridge containing the serial access memory (40) which memorizes the data in which the busy condition of the ink in said ink reservoir (62) is shown, and the data in which the parameter for controlling actuation of said ink jet print head (82) further is shown which can be thrown away (60).

[0056] [Embodiment 15] When it is the ink jet printer of a publication and said parameter for carrying out said ink jet print head (82) control is accessed by the embodiment 14 with said processor means (86), said processor means (86) is an ink jet printer characterized by the control signal over said ink jet printer and an ink jet print head (82) being generable combining said parameter data and other data.

[0057] [Embodiment 16] Are equipment which prints on a medium sheet, and it suits so that the exchangeable components containing the article of consumption used at the time of actuation of the exchangeable components worn out or said equipment may be received. To the receptacle (66) for receiving a processor means (86) to control said equipment, and exchangeable components (60), and said one receptacle (66), a relating eclipse, In equipment including the 1st connector means (70) combined with said processor means (86), said exchangeable component (60) is characterized by including the following (a) and (b).

- (a) The 2nd connector means which engages with said 1st connector means (70) (76).
- (b) Said processor means (86) is equipment characterized by the ability to perform both writing of data to said serial access memory (40), and read-out including the serial access memory (40) which memorizes the data in which it is serial access memory (40), and one data input output line (42) connects with said 2nd connector means (76), and the busy condition of said exchangeable component (60) is shown at least with it.

[0058] [Embodiment 17] It is equipment characterized by being equipment given in an embodiment 16 and controlling said serial access memory (40) to memorize the calibration data for said equipment further, and for said processor means (86) to access said calibration data, and to enable generating of the control signal for said equipment combining said calibration data and other data.

[0059] [Embodiment 18] Are equipment given in an embodiment 16 and said serial access memory (40) memorizes the serial number showing said exchangeable component (60). Said processor means (86) has memorized data, and reads said serial number read from said serial access memory (40). Equipment characterized by attaining identification of said exchangeable component (60) by comparing it with said memorized data.

[0060] [Embodiment 19] Are equipment given in an embodiment 16 and said serial access memory (40) is connected to a fixing assembly. If it judges that it has data about the use hysteresis of the past of built-in silicone oil ON \*\*, and it is going to pass said processor means (86) after the transparence medium sheet has contacted it Equipment characterized by correcting the temperature of said fixing assembly according to the data about the use hysteresis of said past.

[0061] [Embodiment 20] Said processor means (86) is equipment characterized by being equipment given in an embodiment 16, memorizing the parameter which specifies the charge-to-mass ratio of a toner carrier which said serial access memory (40) was connected to the development module, and went into said development module, correcting a setup of other means in said equipment using said parameter, and compensating said charge-to-mass ratio parameter.

[0062] [Embodiment 21] It is equipment characterized by to be equipment given in an embodiment 16, and to memorize the parameter which said serial access memory (40) is connected to a development module, and specifies the reinforcement of the magnet of a development counter, and the field of said development module and the distance between photoconductor drums, and for said processor means (86) to enable adjustment of other parameters in said equipment using said parameter, and to compensate it.

[0063] Please understand the above explanation to be what is what [ only ] illustrates this invention. Probably, a design of various alternative-like modes and the strange gestalt will be possible, without deviating from this invention to this contractor. Therefore, this invention contains all these alternative-like modes applicable to a claim, the deformation modes, and modification modes.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the conventional technical equipment which has the unification fuse with which each exchangeable component was connected to the interface connector by one electric wire.

[Drawing 2] It is the block diagram showing this invention.

[Drawing 3] It is drawing showing the single track interconnect for onboard serial access memory showing the detail of the interface section of exchangeable components.

[Drawing 4] It is the perspective view of the exchangeable ink cartridge of an ink jet printer.

[Drawing 4 A] It is the enlarged drawing of the circuit board of drawing 4.

[Drawing 5] It is the schematic diagram showing the equipment for making connection with the memory chip which connected the ink cartridge of drawing 4 to the ink jet print head, and was further prepared in the ink cartridge.

[Drawing 6] It is the logic flow Fig. showing actuation of the printer system of drawing 5 according to the data memorized by the ink cartridge.

[Drawing 7] It is the logic flow Fig. showing actuation of the printer system of drawing 5 according to the ink busy condition data memorized by the ink cartridge.

### [Description of Notations]

10: Interface

12: Oil pad module

14: (Black K) toner development module

16: Color development module

18: Fixing assembly

20: Imprint assembly

22: Photograph drum assembly

24: Fuse

26: Fuse fusing circuit module  
28: Control computer  
30: Contact  
32: Ground connection  
36: Receptacle  
38: Printer  
40: Memory chip  
42: Electric wire  
50: Exchangeable components  
52: Connector  
54: Interface board  
56: Electronic-parts module  
58: Memory line  
60: Ink jet print cartridge  
62: Ink reservoir  
64: Liquid communicating tube  
66: Receptacle  
68: Diaphram  
70: Electrical connection  
72: Contact  
74: Circuit board  
76: Serial memory chip  
78: Protective coat  
80: Key device  
82: Ink jet print head  
84: Conduit  
86: Microprocessor

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[Translation done.]